the OIL AND GAS JOURNAL

DECEMBER 8, 1958

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GREAT BASIN

. . . giant sleeper of the West

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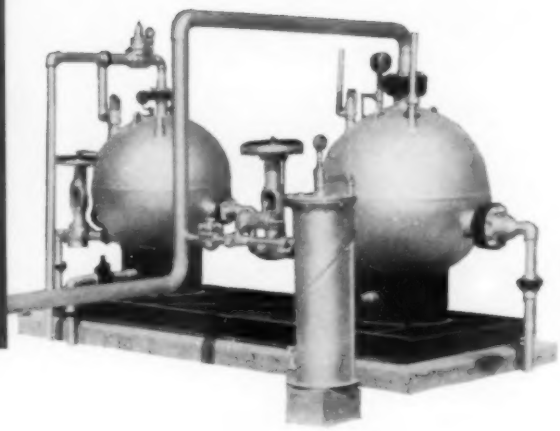
MID-CONTINENT NEWS



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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Dec. 8, 1958

Heavy imports are causing conservation headaches:

This backlash of the big imports problem was reported to the Oil Compact by a special study committee. It pointed up one fact: Conservation programs must pay their way.

When conditions in the domestic oil industry are depressed, projects to conserve oil and gas reserves by preventing waste also suffer.

Sentiment for a tariff on petroleum imports surprisingly cropped up in the Compact committee session and in the report. Some members also termed as unreliable any voluntary approach to controlling the flood of imports (p. 43).

▼ ▼ ▼

Japanese interests may join the Alaskan oil hunt.

Alaskan officials have revealed that the Japanese are actually considering entering the current leasing and exploration phase of Alaskan developments.

The reason: The Far East is extremely interested in Alaska as a source of crude supplies. If oil is discovered in quantity in Alaska, the Orient could become a major market for the new state. Otherwise Alaskan oil will compete with Canadian crude in the Northwest refining area.

▼ ▼ ▼

Auto engineers now predict gas turbines will make their appearance in production-model autos within 2 to 7 years.

Technical problems have been solved. Still ahead are problems of reducing costs and designing chassis and body specifically for the turbine.

Most likely spot for first models of gas turbine will be in low-priced, high production auto. Gas turbines must be manufactured in large quantity to get the cost down.

Small-car boom could boost gasoline consumption.

Some economists view the trend this way: If small cars are used to augment larger all-purpose cars, it's possible the per capita use of cars will increase.

The growth of personal transportation thus will be much faster than expected from population increase and the result will be a larger demand for motor fuel.

That 27-well platform planned for offshore work in the Gulf of Paria by the five-company American combine is bogged down again.

The Venezuelan Government this time is providing the hitch. Venezuela is withholding permission to build the big platform. It wants to study the causes and effects of the blowout and fire on the CATC multiwell platform off Louisiana.

Argentina may complete exploration deals with Jersey Standard and Shell under its no-concession-but-a-contract plan.

Buenos Aires reports indicate the deals involve $100-million contracts with each company for exploration in new areas.

But in another area, hopes for the $800-million drilling pipeline deal the Floyd Odlum-Williams Bros. group offered Argentina are dimming.

Whole thing is deadlocked. Argentina is complaining that terms in the contract submitted by the Americans don't tally with those outlined in letters of intent signed earlier.

Latin American oil changes:

...Antonio J. Bermudez is out as head of Pemex. He is succeeded by Mexican Industrialist Pascual Gutierrez Roldan.

...Carlos Perez de la Cova is returning to Venezuelan embassy in Washington after being replaced in the top oil job at home.

▼ ▼ ▼

Signs of cost cutting and slowed drilling activity still persist in some areas.

For instance, Magnolia closed three of its five machine shops this month in another series of recent moves to cut costs. Action was taken because there was too little drilling activity to keep all the shops busy.

The closed shops are at Vanderbilt on the Gulf Coast, Alice in South Texas, and Kilgore in East Texas. Two shops kept open are at Kermit in West Texas and Duncan, Okla.

About 60 employes were affected. About half were moved to other jobs, some retired, and less than 30% were terminated.

▼ ▼ ▼

The central Montana plains may stage an oil comeback based on a new discovery in Rosebud County.

Honolulu Oil apparently has an Amsden producer and this has started a flurry of offsets. This section of the Rockies has been quiet since the Wolf Springs play died down. Wolf Springs also was a major Amsden producing area.

Look for San Juan basin's current Dakota Cretaceous push

to move over into southwest Colorado in earnest.

Val R. Reese is spearheading the search at his 1-35 Bascom in the South Red Mesa area of LaPlata County. The well flowed 2,800 M.c.f. daily from the Dakota.

A campaign to explore Mississippian formations in Utah's northern Paradox basin may not be far off.

Shell has option on more than 19,000 acres northwest of Big Flat field. The agreement calls for Mississippian exploration if the option is exercised.

▼ ▼ ▼

Tougher geology courses are being planned by the nation's colleges and universities.

Many oil finders attribute serious unemployment problem in their profession today to lax control and poorly planned curricula in geology departments. Some schools already are at work on the problem.

University of Texas has tightened requirements for majors and graduates and has instituted high-grade emphasis to restrict its output of geologists. Enrollment has been cut in half from the 1954-55 figure. And Texas authorities predict a possible shortage of geological personnel within 2 or 3 years.

Geologists of the future must know more about the mechanics of secondary-recovery projects.

Reason: Initial wells on a structure or over a strat trap will have to be located with input-well pattern in mind. This will eliminate drilling unnecessary wells. The present practice of plugging scores of unnecessary wells when secondary-recovery mechanism is set up will be avoided.

▼ ▼ ▼

Legal squabble will linger far into 1959 over merger of El Paso Natural and Pacific Northwest.

An FPC examiner will resume hearings in case December 12. He'll take testimony from California officials who oppose the merger.

The FPC may rule early next year on question of merging physical assets of the two companies. After that, the case is expected to be reopened by U. S. District Court in Salt Lake City where antitrust charges are pending.

Los Angeles discovered one important fact from its recent severe smog attack. It doesn't have enough standby gas capacity to support a complete ban on fuel-oil burning.

Such a ban was urged by officials, but gas companies warned they couldn't meet the sudden demand that would be created.

Gas suppliers estimate that if a cold spell should hit

during a period when fuel oil was banned, gas requirements would reach 2.166 billion cubic feet daily.

Peak gas deliveries in Los Angeles area so far this year came on November 17 when 1.963 billion cubic feet went to users. But to achieve this, gas companies had to cut off 203,000 M.c.f. daily from industrial customers on interruptible contracts.

▼ ▼ ▼

Dow's benzene deal with the Russians is focusing new attention on this petrochemical market.

Dow, it is reported, will pay about $13.5 million for 54 million gallons of Russian benzene over the next 2 years. That's about 25 cents per gallon compared with current domestic price of 31 cents.

Recent Journal survey shows American refiners have a big spare capacity for BTX production. This overcapacity was partly responsible for a 5-cent a gallon price drop on domestic benzene in late summer.

▼ ▼ ▼

Success of the 1958-59 heating-oil season will be determined within the next few weeks. Main factors: Weather and realism of refiners in tailoring their runs to demand.

Distillates are in a firm position on the East and Gulf coasts. Demand is up, stocks are down. But in Mid-Continent area their position is weaker, mainly because refinery runs have not been curtailed to meet low demand levels in the area.

Cooler weather on West Coast is helping California's producers of low-gravity crude. It's stepping up the demand for residual fuel oil.

The result is that current excessive stocks may be worked off without new price cuts. But the long-range outlook for resid and heavy crude still is not good.

One solution: More catalytic cracking and coking capacity at West Coast refineries to convert the lower fractions into gasoline blending stocks.

But until new capacity is added—and that is 2 years off at best—refiners expect prices for crude below 26° gravity to remain depressed.

Tidewater will operate the pilot plant testing the new Townsend sulfur-recovery process which has attracted so much interest in production circles.

Plant location will be in the New Hope area of Franklin County, East Texas.

Sour gas at 1,800 psi., containing 15% hydrogen sulfide will be treated in the plant.

Tidewater is working with Hudson Engineering Corp. in the operation.

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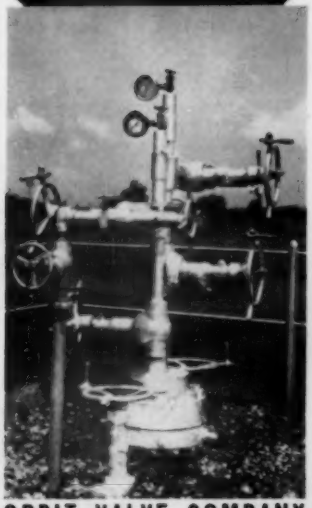

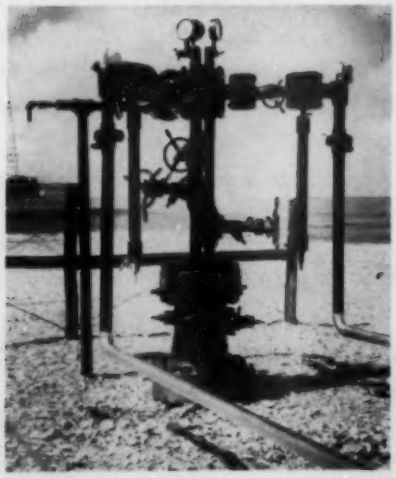

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TECHNOLOGY—OPERATION

Refining-Processing

How Conoco Treats Waste Water at Ponca City 73

By C. D. Hull

During the past several years the refinery has spent about $363,000 on waste-water facilities. These include holding ponds, steam-stripper unit, consolidation of effluent into one outfall stream, and a biological-oxidation unit.

Gas Alarm for Cooling-Water Systems 85

Here's a simple, low-cost instrument for detection of leakage of C_5 and lighter hydrocarbons or other light gases into cooling water systems.

Costimating 93

The cost of process steam and steam to activate steam jets is often the largest single cost in the operation of petroleum vacuum units.

Questions on Technology 108

Heat losses from buried storage tanks.

Drilling-Production

Here's How Shell's 5 Rumberger Was Drilled 77

By W. B. Bleakley

This 24,002-ft. well is currently the world's second deepest, and the Beckham County test is the deepest yet in Oklahoma. It took Helmerich & Payne 15 months from spudding to total depth.

Speedy Drilling in Volcanics 86

By D. H. Stormont

Operators in California's new North Tejon field find control of mud weight and use of high circulating rates result in less time spent in highly fractured basaltic section.

King-Size Gun Barrel Installed in West Texas 88

It's designed to treat 7,000 bbl. per day with a 17-hour retention time for all well fluids in the treating tank.

New b.s. and w. Recorder Features Automatic, Continuous Operation 102

By Robert S. Wood

This capacitance-type instrument utilizes the large difference in the dielectric constants for water and crude oil to measure water percentage. The constant for water is 80 or more; that for crude is about 2.25.

Pipelining

How Interstate Uses Deep Ground Beds to Protect Bare Pipelines 94

By Robert L. Bullock

These devices have made cathodic protection of bare pipelines in high-resistance soil economical. A new type employing graphite rods and coke breeze backfill has been successfully field tested.

Exploration

Let's Stop Selling U. S. Reserves Short 80

By Morgan J. Davis

"Even a cursory survey with little allowances for improvements in recovery techniques makes it possible to forecast within the next 20 years minimum additional supplies of about 70 billion barrels of crude oil alone from known fields and acreage already under lease."

Huge Strat Trap Outlined by Wyoming Drilling 113

Cottonwood Creek in Wyoming's Big Horn basin is rapidly emerging as the best oil field found in the state in the past 5 years. Today its daily production of 15,000 bbl. makes it Wyoming's second largest oil producer.

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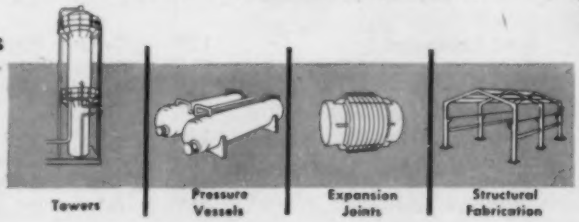

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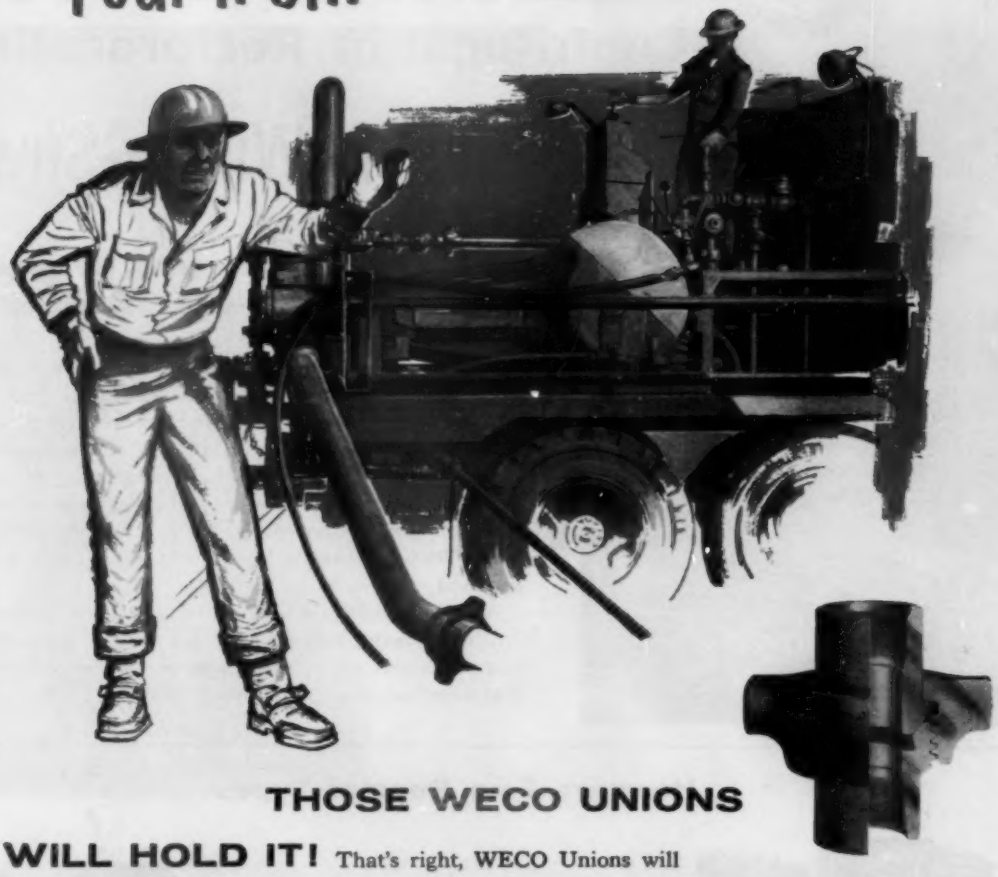

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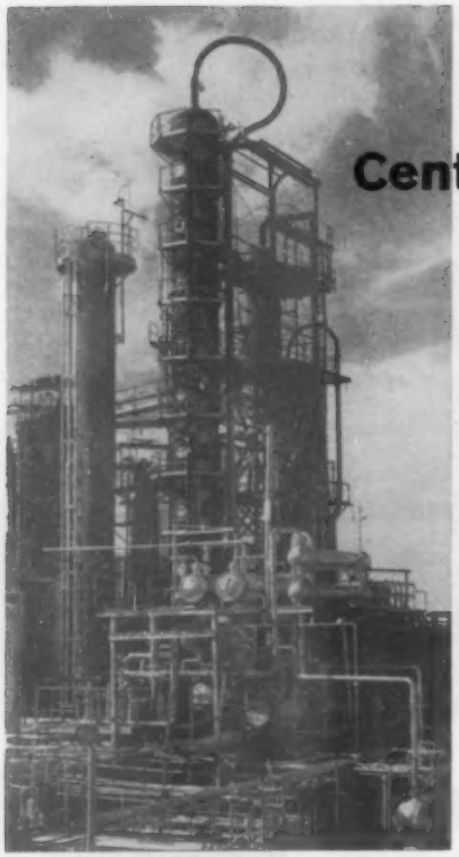

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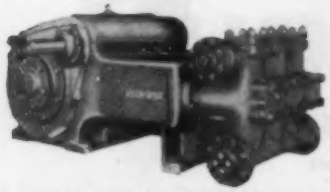

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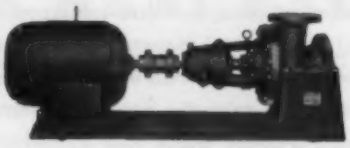

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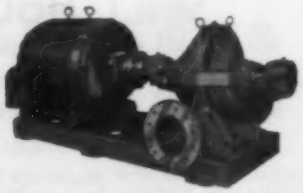

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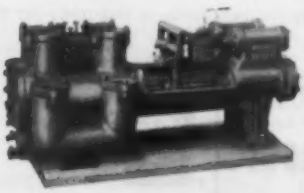

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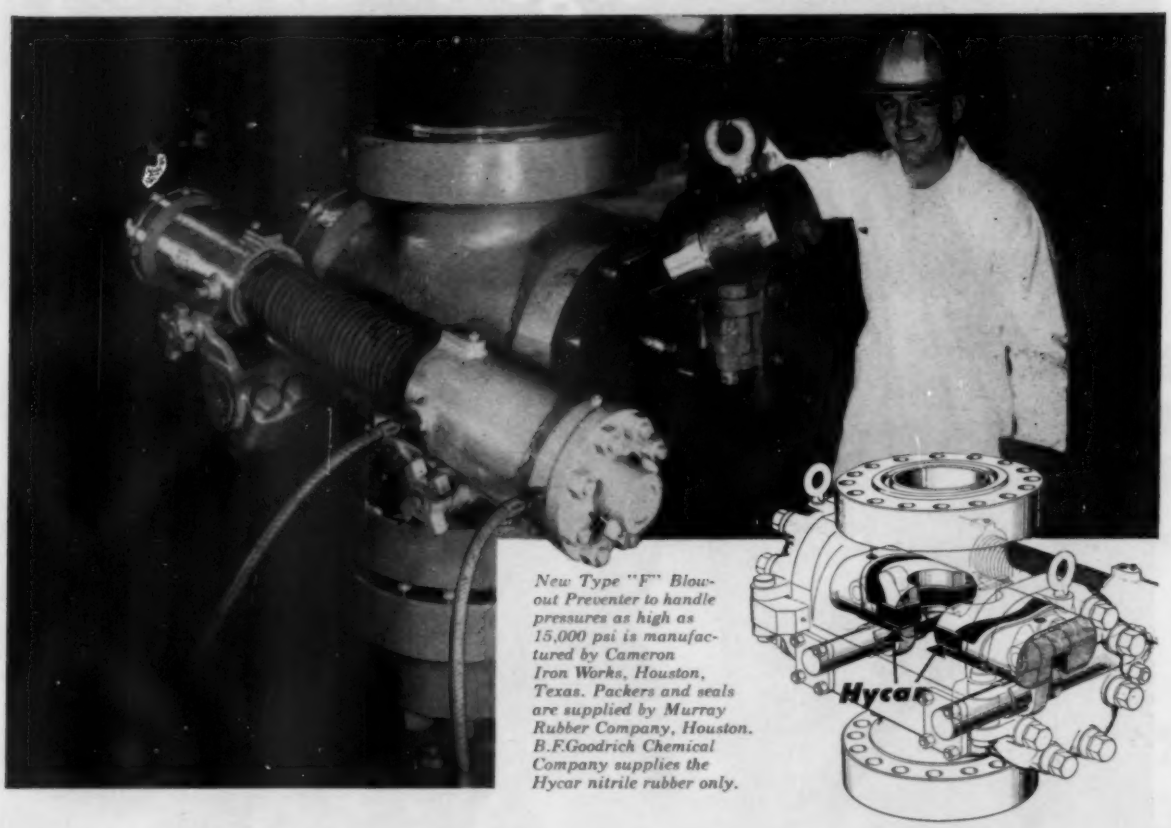


New Type "F" Blowout Preventer to handle pressures as high as 15,000 psi is manufactured by Cameron Iron Works, Houston, Texas. Packers and seals are supplied by Murray Rubber Company, Houston. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber only.

In new blowout preventer

Hycar helps hold down 15,000 psi

THIS new blowout preventer is designed to handle well pressures as high as 15,000 psi. Its rams are equipped with packers and seals made from Hycar nitrile rubber.

The function of this equipment depends on the oil-resistant characteristics of Hycar. Oil and gas entrained in the drilling mud, or even an oil-base drilling fluid, has no swelling or deteriorating effect on the ram packers and seals. Thus, the rams always move freely, seal unfailingly.

The manufacturer says, "With the rams in closed position during a threatened blowout, it is often necessary to rotate and work the drill pipe to prevent sticking the pipe. The ram packers are subjected to much severe abrasion and tearing action. The Hycar packing elements are built to take this rough treatment."

Here's another example of how Hycar nitrile rubber can provide results under tough operating conditions. For more information, write Dept. KC-7, B.F.Goodrich Chemical Company, 3135 Euclid Ave., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

Hycar
American Rubber

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

man on the verge of discovery

BJ swabs

He's already discovered that Byron Jackson's new swabs cost less because they require fewer parts and accessories to accomplish more kinds of swabbing jobs.

Before the day is over he'll discover that BJ swabs put more fluid in the tank, in less time, with fewer rubber replacements.

BJ swabs pull the greatest possible loads — yet their exclusive flexible feature allows them to adjust to light or medium loads, too.

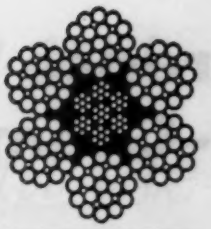
You get a choice of cup-type or disc-type rubbers. Two of either kind fit on the streamlined body. Your supply store has BJ swabs in stock. The investment is small; discover them for yourself.

WATCH BJ FOR THE NEWEST

BYRON JACKSON TOOLS, INC.

A SUBSIDIARY OF BORG-WARNER CORPORATION

P. O. Box 2017A, Terminal Annex, Los Angeles 54, California • Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York



For **extra high** strength

use

WICKWIRE

DOUBLE GRAY

...save money...increase safety

In many operations where wire ropes occasionally operate near their breaking strength, it will pay you to switch to Double Gray. If you use Double Gray on your present equipment, under equal load conditions, you'll get a safer, more economical operation. That's because Double Gray's higher strength* allows you to operate with a greater safety factor—resulting in longer rope life and less equipment downtime.

***** *Wickwire Double Gray Wire Rope is made of extra-improved plow steel. Fortified by an independent wire rope core of the same extra high strength steel, Double Gray rope has a 15% higher breaking strength than the catalog breaking strength of an improved plow steel rope with IWRC.*

For your free copy of our informative new Double Gray booklet, write to:

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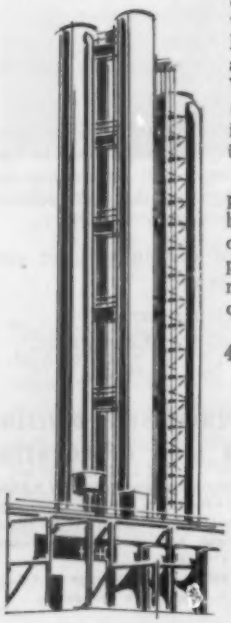
6401

LOOK FOR THE YELLOW TRIANGLE

Increase the service life of Petro-Chemical Pumps 20 times

Pump liners courtesy of McCartney Manufacturing Co., Inc., Baxter Springs, ... s



Stainless steel liners, like that shown above, were used in piston and plunger-type pumps. But they required reringing every 150 hours and had to be replaced after 500-700 hours. With Carboloy cemented carbide liners (13⅞" x 2 1/16" ID x 3" OD) service life was increased 20 times . . . and costly reringing is reduced to a minimum.

Another problem had been leakage in plunger-type proportional pumps caused by abrasive liquids scoring the plunger. In one case, pumps working in excess of 25,000 psi had steel and Stellite plungers. Packing needed constant tightening, and complete overhaul was necessary every 30 days.

Carboloy carbide plungers with a finish of 4 RMS or better in the packing area were tried. After 3 months, there was no indication of packing leakage, and these plungers are still in use after 2 years.

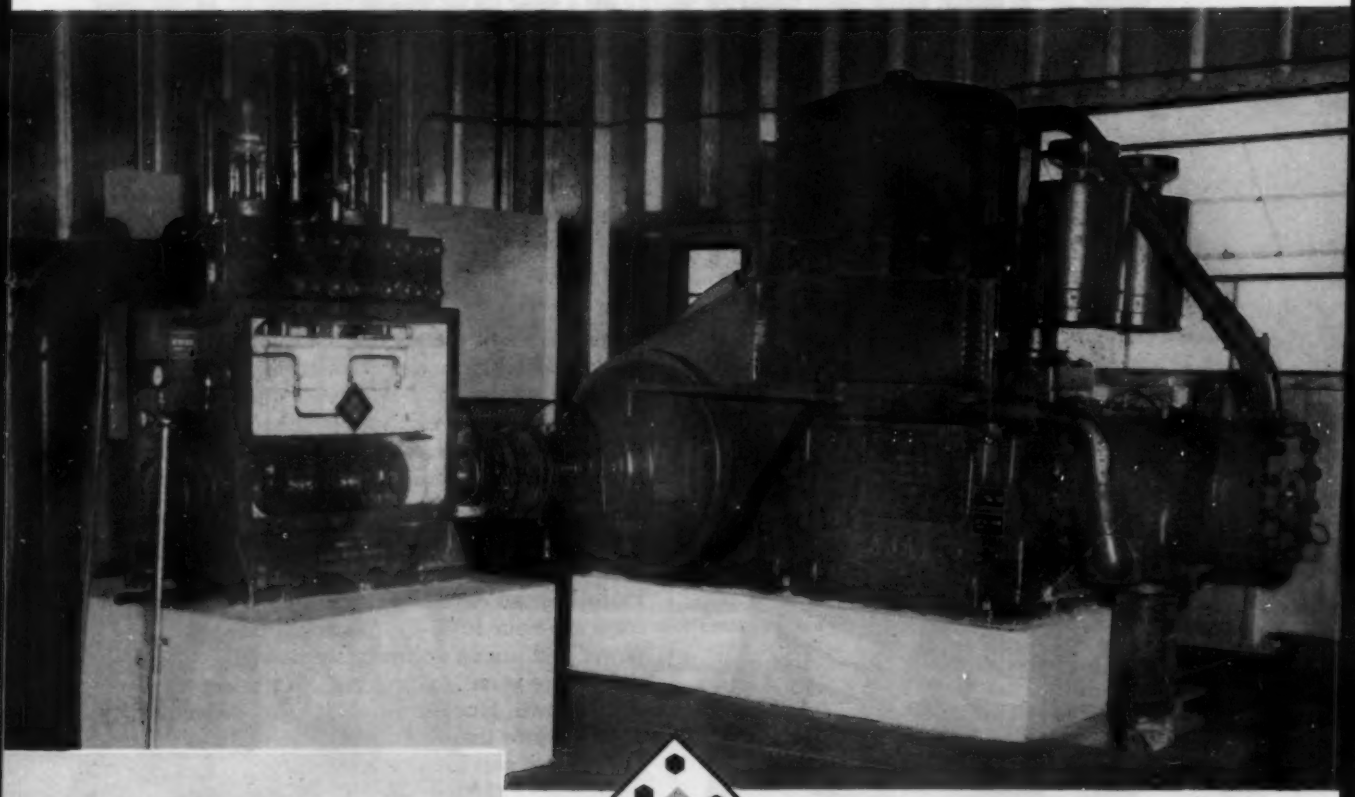
Carboloy cemented carbide is harder than hardest steel. It takes a high polish and resists the corrosive action of catalytic slurries and other acid and abrasive conditions. That's why Carboloy cemented carbides deliver such extraordinary service . . . reducing costly maintenance and shutdowns.

For more information on how Carboloy cemented carbides can lower your petroleum and petro-chemical costs – or a copy of the new Carbide Engineering Book (WR-111) – write: *Metallurgical Products Department of General Electric Company, 11181 E. 8 Mile Street, Detroit 14, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

You can be sure when you go Ajax all the way!



A modern West Texas waterflood installation—four Ajax Engines driving four Ajax Pumps.

AJAX

GAS ENGINES PRESSURE PUMPS

The good hard sense in going "AJAX all the way" shows up year after year. Match an Ajax Gas Engine with an Ajax Pump and you get a balanced workhorse team. You get undivided responsibility for maintenance. You benefit by a single interest of the builder in the performance of engine and pump alike. • Small wonder that experienced production men agree, "If you want to be *sure* of your waterflood jobs—go AJAX all the way!" *Ask your supply man.*

Ajax IRON WORKS

Builders of GAS AND OIL ENGINES • PRESSURE PUMPS

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA. • R. B. MOORE SUPPLY CO., BOLIVAR, N. Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

NEW American®
GASCLOK Power Drive
constant high power • uniquely accurate

Actual Size

American's new ***GASCLOK*** is a completely self-contained air or gas powered instrument drive and timing unit. Supplying a constant power output of over 20 times the torque delivered by conventional spring-wound clock mechanisms, it is ideally suited as either original or replacement equipment where continuous power and accurate timing are essential.

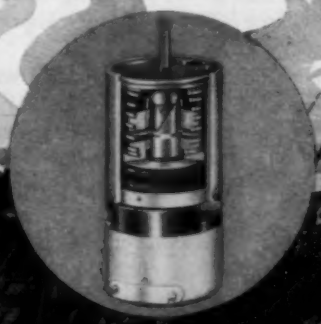
Perfect for all circular or strip chart records from one-hour to 30-day periods. Constant power and timing accuracy are assured since there is no "mainspring" to weaken or run down. Rugged durability and dependability are built into the ***GASCLOK*** Power Drive for years of service with minimum maintenance. It can provide new metering accuracies and economies for you.

for instrument driving and timing self-starting • air or gas operated

The versatile ***GASCLOK*** Power Drive is designed and field-tested for long trouble-free operation in remote location installations with all makes and types of recording instruments.

The high-torque, continuous drive provides power for: *Integrating Orifice Meters—Gas Lift Meters—Pressure Recorders Strip Chart Recorders—Telecounter Units—Field Program Timers* and many other instrument applications for accurate, automatic operation.

- **Self-starting mechanism completely self-contained—requires no winding or "priming" of power unit.**
- **Gas or air consumption only 5 cfh—normal operating pressure 5 psi—rotation 2 rpm.**
- **Timing escapement spring rewound every 5 seconds—eliminates fluctuating torque.**
- **Accuracy of timing unaffected by wide fluctuations in supply pressure.**
- **Timing mechanism internally sealed to prevent corrosion and clogging—all power unit parts exposed to gas are aluminum or stainless steel.**
- **Inherently explosion-proof.**
- **Large area internal ports to prevent plugging. All internal ports easily cleaned.**
- **Installation in any position—variety of mounting brackets available.**



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INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO EST 1836 MEASUREMENT ENGINEERS ®

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SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

From Liberty Mutual: a concept of workmen's compensation coverage for today's economic conditions which provides

Protection in

—and how it cuts excess dollars from compensation insurance costs

The business-insurance rates you pay are, in the long run, determined by you

In today's business climate, it's more important than ever for you to keep your expenses down. If you have a large number of accidents, however, or suffer heavy losses over a period of time, you actually contribute to higher insurance rates for yourself. By doing everything you can *right now* to cut down on accidents and eliminate losses, you can help toward lowering your rates *in the future* — and help improve your company's profit picture.

This is why Liberty Mutual — the company with the largest experience in workmen's compensation insurance — has over the years developed a forward-looking concept of business insurance which gives you protection in depth. From the start of your coverage, a broad range of skills and resources can be put to work to anticipate and avoid trouble on your drilling sites and to keep future costs down.

Today, more than ever, *PROTECTION IN DEPTH* can be vital to the growth of your business

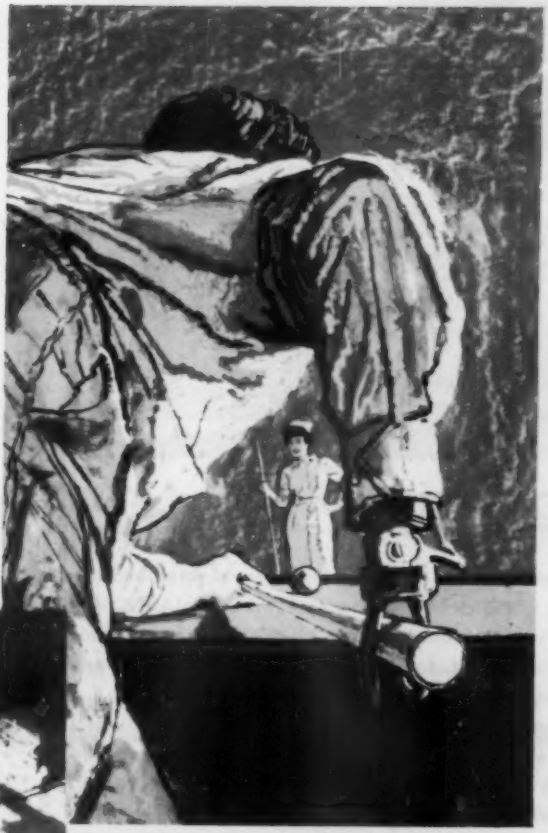
With competition so strong in the oil-well drilling industry, it is apparent that the vigorous, efficiently managed companies will become the industry leaders of tomorrow. The protection in depth you get from Liberty not only helps you trim excess dollars from your insurance costs, but does it without sacrificing any of the coverage you need to safeguard your company during its growth.

Protection in depth has already helped Liberty establish an impressive cost-cutting record and a record for consistently attracting "blue-chip" accounts. Because we deal directly, our salesmen know their business — and yours. With the vast experience of the company behind them, they can competently handle unusual problems in all fields.

We encourage you to take steps to improve your insurance cost picture by becoming acquainted with protection in depth now. (You should also know about our dividends: since 1912, we have returned more than $455 million to reduce policyholders' insurance costs.)

depth

New look at injuries—new savings. In 64 areas of the country, Liberty retains leading specialists to check the diagnoses of serious cases and assist treating physicians. Result to policyholders: lower compensation costs.



Rebuilding injured men through prosthetics, physical and occupational therapy is the function of Liberty's two rehabilitation centers. Badly injured employees of policyholders help themselves recover, get back on the job and off compensation.

Finding trouble before it happens. Liberty's loss-prevention engineers visit your rig, spot hazards, suggest ways to eliminate them. Result: fewer lost-time accidents, lower insurance costs in the future.

The broad range of Liberty's special skills and resources protects four vital areas

From Liberty's protection-in-depth resources – many unique in the insurance business – has come a new, 4-way insurance program for oil-well drillers. This program can save you money, assure you of protection in depth in four important areas. Here's what it does:

Protects your rig. Gives you realistic coverage against fire, wind, explosion, blowout, collapse and many other disasters. Loss-prevention engineers work with your crew, help spot accident hazards, give money-saving recommendations.

Protects your men. We help you set up your own on-the-rig medical program. Our hygienists check working conditions, and when accidents do happen, our claimsmen assure speedy medical care.

Protects your fleet. Safeguards you against damage to your trucks and company cars, and against crippling lawsuits for liability.

Protects your company. Drilling-site hazards to the public are great. Jury awards for bodily injury can put a driller out of business. Our Public Liability coverage protects your company against this kind of trouble.

Pictured on these pages are some of the many "extras" that put teeth into this 4-way protection-in-depth program. All of them are available to any policyholder who needs them.

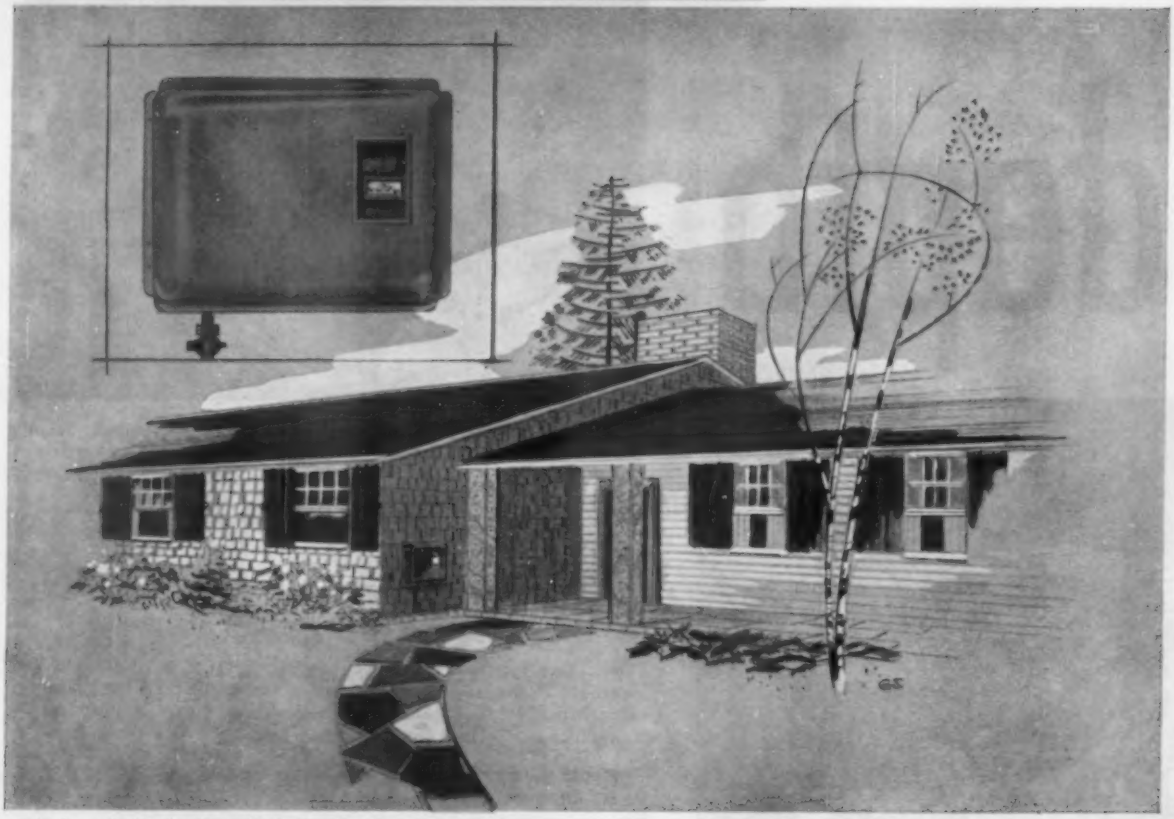
Look for more from

LIBERTY MUTUAL

...the company that stands by you

LIBERTY MUTUAL INSURANCE COMPANY • LIBERTY MUTUAL FIRE INSURANCE COMPANY • Home Office: Boston
Insurance for: Automobiles, Liability, Group Accident and Health, Fire, Workmen's Compensation, Marine, Crime

Naugatuck KRALASTIC



Meter Boxes by Handley Brown Heater Co., Jackson, Michigan

Gas meter covers go modern

Attractive new meter covers are among the latest in a long parade of products made better, many even made possible, through the use of versatile KRALASTIC® rubber-resin.

Modern in every sense is KRALASTIC... lighter than aluminum, dentproof, rustproof, rotproof, unaffected by weather, integrally colored, easily molded to any shape and texture for smart and *lasting* service.

And here, in these pleasingly utilitarian meter covers, is an excellent example of KRALASTIC's properties at work. Lightweight in looks as well as in fact, these covers blend gracefully with any home. The thin, tough, well-designed shell can either be mounted outside or recessed into the wall for a still cleaner appearance. With KRALASTIC, the first cost is the last. Yet these clean, modern, *practical* covers pay quiet, continued tribute to the service itself for years.

Consider the modern advantages KRALASTIC offers you... not only in meter covers, but in pipe, valves, and fittings as well. In tool boxes, pump housings, in the products you make or use. For more information on the product improvement possibilities KRALASTIC offers you, write the address below.

United States Rubber

Naugatuck Chemical Division Dept. A Elm Street Naugatuck, Connecticut

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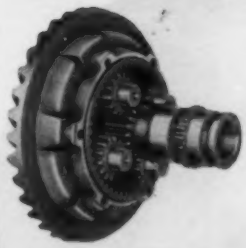
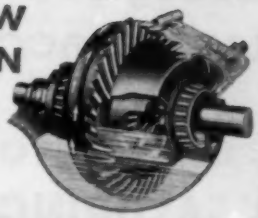


PLANETARY GEARING

—distributes pressure and wear over four planetary gears, resulting in lower unit stress, reduced maintenance, longer axle life.

FORCED-FLOW LUBRICATION

—supplies positive lubrication to all moving axle parts, even at slowest vehicle speeds.

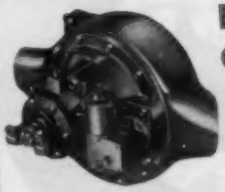


SELF-CONTAINED AIR BRAKE

—provides for greater braking efficiency; quick action and quick release; quick easy reline. Available on Eaton air brake models.

POSITIVE SHIFT CONTROL

—on 2-speed models, provides quick, easy shifts. Drivers use available gear ratios—the right ratio for each road and load condition.



EXTRA-RUGGED CONSTRUCTION

—eliminates the possibility of harmful distortion or misalignment under full load, holds maintenance to a minimum.

INDUCTALLOY AXLE SHAFTS

—handle more pounds of torque without fatigue failure; last 3 to 10 times longer. Keep trucks on the road, reduce maintenance expense.

These EATON AXLE Features Save Money for Truckers

The advanced features built into Eaton's practical, down-to-earth axle designs add up to rugged dependability, less shop time, easier maintenance, longer axle life. They enable truck operators to get the most out of their hauling equipment at lowest possible cost. Ask your truck dealer for complete information.

More than Two Million Eaton Axles in Trucks Today

EATON

AXLE DIVISION

MANUFACTURING COMPANY

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PRODUCTS: Engine Valves • Tappets • Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Gears • Hydraulic Pumps Truck & Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters & Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf & Coil Springs • Dynamatic Drives & Brakes

designed for target accuracy...

HALLIBURTON
MEASURING EQUIPMENT

First in the field... First in performance... this is the record Halliburton has achieved in the development and pioneering of Measuring Devices. Halliburton has maintained constant leadership in advancing improved Measuring Equipment through continuous research, keeping pace with current demands.

Many different types and varieties of manually operated or power-driven measuring assemblies can be selected for your specific requirements, with the assurance of accuracy, simplicity and effectiveness.

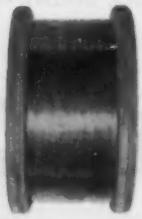
Your local Halliburton Representative will gladly assist in analyzing your needs and help to select the units best suited for your particular operation... call him today.

HALLIBURTON MEASURING EQUIPMENT...
FOR WELL CALCULATED MEASUREMENTS

MEASURING LINES

Halliburton has more years experience with rounded steel measuring lines than all other organizations of its kind. Changing field requirements and modern operations demand even more rigid specifications, permitting only those lines that do the best job to be offered. Your requirements determine which is most suitable...

REGULAR LINE

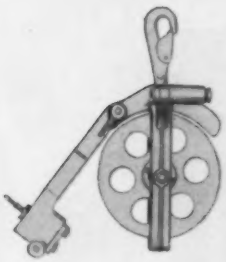


GALVANIZED LINE

* Regular, Bright and Improved Steel—for economical use in wells under normal condition.

* Stainless Steel—designed for longer life when attacked by sour crude oil or gas.

* Galvanized Steel, Zinc Impregnated—will not rust, check or peel under normal operating conditions.

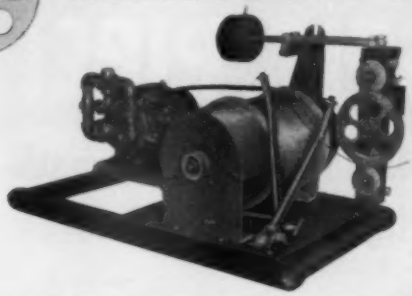


LATCH TYPE HAY PULLEY WITH LINE WIPER

This standard assembly is recommended for paraffin cleaning and may be used to run line in open hole, drill pipe, tubing or casing. The Halliburton Measuring Line Wiper keeps line clean and assures greater accuracy and longer life.

STUFFING BOX AND STAFF ASSEMBLY

Recommended for measuring in open hole or casing while well is shut in under pressure up to 15,000 psi. The wearing surface of measuring line sheave is made of durable, long-wearing material and is precision designed.

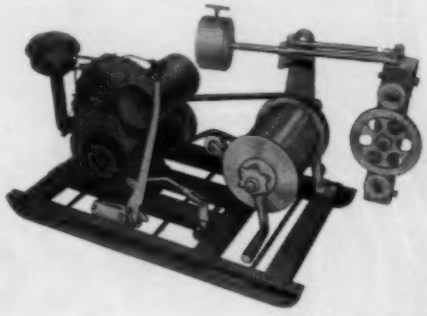


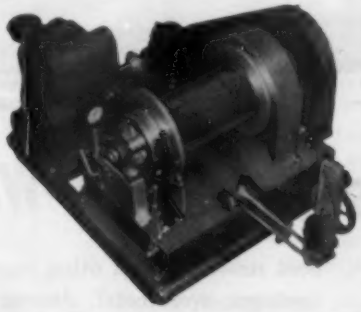
AIR-POWERED MEASURING ASSEMBLY

Driven by compressed air power for greater safety and flexibility. Suited for well measurements requiring high starting torque, accurately controlled variable speed, or where possible safety hazards exist. Powered by radial 5-cylinder air motor, with built-in gear reduction.

REGULAR DUTY TYPE POWER-DRIVEN

Designed for fast, efficient service on light measuring operations. Driven by single cylinder, air-cooled, 4.3 H.P. Briggs and Stratton gasoline engine with gear reduction power take-off. Reel is equipped with V-Belt Drive, V-Belt Idler Pulley Clutch Assembly and will carry 8000′ of .092″ dia. measuring line.





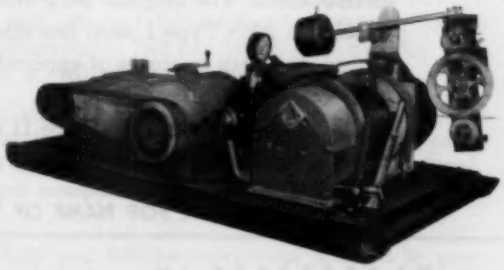
SUPER DUTY TYPE POWER-DRIVEN

Designed for measuring work requiring large amounts of Measuring Line or small amounts of cable used in wire line services. Powered by a Wisconsin AEN 8.25 H.P. engine with a 6.1 clutch reduction. Super Duty Reel is capable of performing severe oil field wire line and conductor work and will carry 3000′ of $^{3}/_{16}$″ dia. cable.

EXTRA-HEAVY DUTY POWER-DRIVEN

(Three Speed Transmission)

Designed for accurate and efficient measuring in the deepest wells under the most rugged conditions. Used where dependable electric AC power is available. Measuring Assembly is powered by a 5 H.P., 220-440 volt, 3 phase, 60 cycle uni-closed variable speed electric motor. (Explosion proof motor is available at additional cost.) The unit features a mechanical transmission, with three speeds forward and one speed in reverse, for operations where unusually low line speeds or maximum line pull are required. This Extra Heavy Duty Reel Assembly will carry 14,000′ of .092″ dia. measuring line.



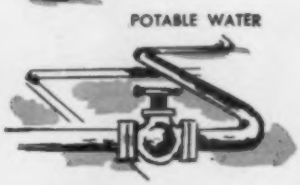
284 SERVICE CENTERS...TO SERVE YOU BETTER

HALLIBURTON MEASURING EQUIPMENT

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

REMARKABLE *new* RIGID PLASTIC PIPE!

★ Higher Tensile Strength
★ Higher Heat Resistance



MADE OF CYCOLAC® C ABS
ABS TYPE II
Thermoplastic Resin
(NSF APPROVED)

New Thermoplastic Resin from BORG-WARNER

Now there are two types of ABS rigid plastic pipe made of Cycolac, the *tough* thermoplastic. The original Borg-Warner Cycolac L ABS Type I resin has already proved its worth in scores of applications from coast to coast.

The new Cycolac C ABS Type II resin offers increased tensile strength, greater heat resistance and other important advantages over metal. Among these are light weight, ease of installation and protection against corrosion.

To users of pipe, Cyclolac C offers superior service over a greater range of temperatures with increased chemical resistance.

WRITE FOR NAME OF YOUR NEAREST CYCOLAC EXTRUDER

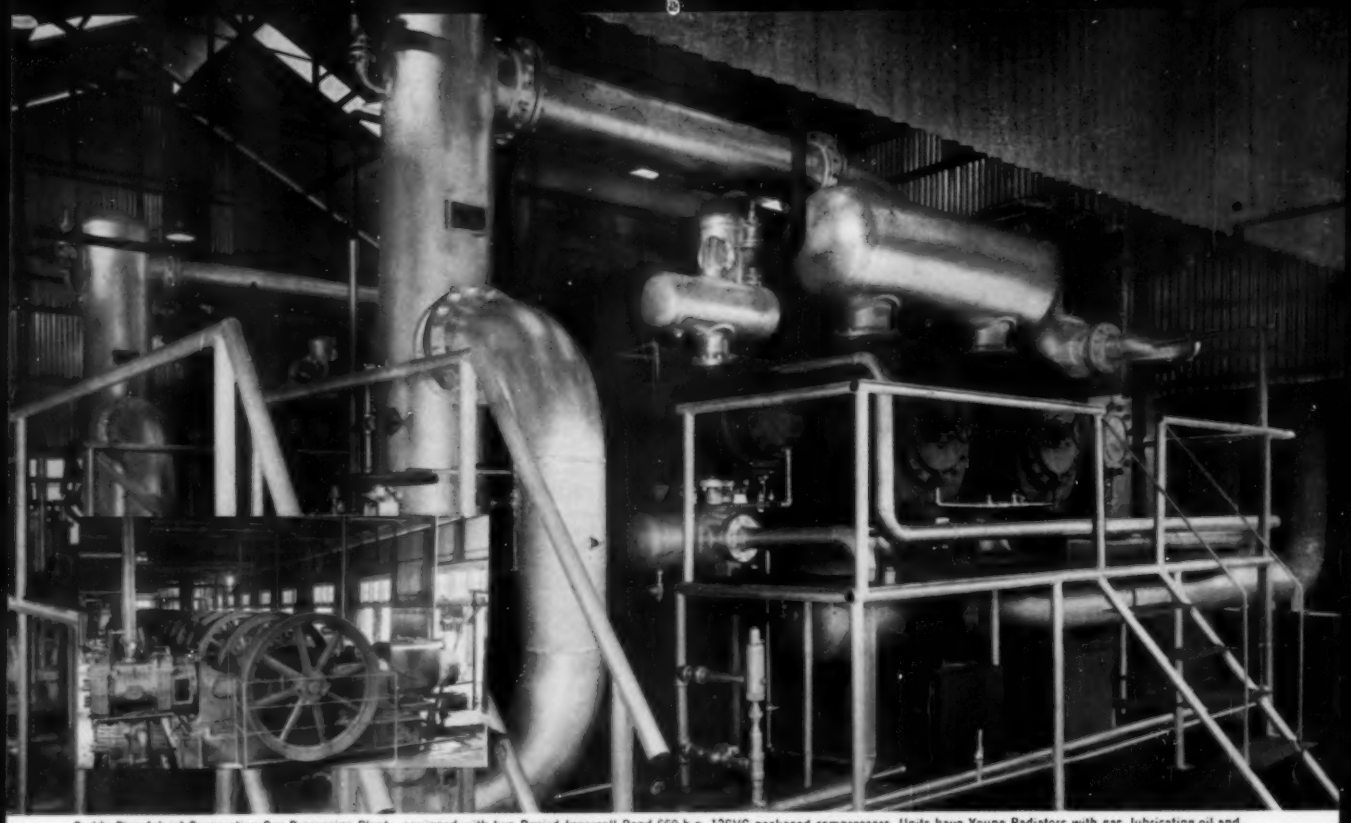
PACESETTER IN
Marbon CHEMICAL
SYNTHETIC RESINS

DIVISION of BORG-WARNER
WASHINGTON, W. VA. • GARY, INDIANA
also represented by:
WEST COAST: Harwick Standard Chemical Co., Los Angeles, Cal.
CANADA: Dillons Chemical Co. Ltd., Montreal & Toronto
EXPORT: British Anchor Chemical Corp., New York

BW ® Marbon

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant

Lowest Cost Per Horsepower Installed



Caddo Pine Island Corporation Gas Processing Plant—equipped with two Beaird-Ingersoll-Rand 660 h.p. 12SVG packaged compressors. Units have Young Radiators with gas, lubricating oil and engine water cooling sections. Other sizes 120 to 660 h.p. Inset picture shows original horizontal compressors.

Two Packaged Compressors

DO WORK OF TWENTY OLDER UNITS

Caddo Pine Island Corporation processes flare gas from 1,000 Pine Island Field wells in an absorption plant located near Oil City, Louisiana. Picking its load up over a thirty mile gathering system, the plant was originally equipped with twenty horizontal compressor units. These have now been replaced by two Beaird-Ingersoll-Rand 12SVG 660 h. p. packaged compressors.

Using three stages of compression the packaged units pull the gas into the plant under ten inches of vacuum. It is then boosted through processing operations and returned for third stage boosting to the sales line. Up to 5¼ million cubic feet can be handled per day with final delivery pressures of 440 psi.

Installation of modern Beaird packaged compressors has increased plant dependability and lowered fuel, labor and maintenance costs. An additional savings will be realized when the field is depleted. Installation of packaged compressors has made the station almost wholly salvable.

Let Beaird engineers help you find an economical solution to your plant expansion or modernization program.

BEAIRD
another AMF product
PACKAGED COMPRESSOR PLANTS

Packaged Compressors are just one of the many products manufactured by Beaird for the petroleum and petrochemical industries. When you are in the market for new equipment or assistance in developing a specialized product . . . contact Beaird for a qualified appraisal or quotation.

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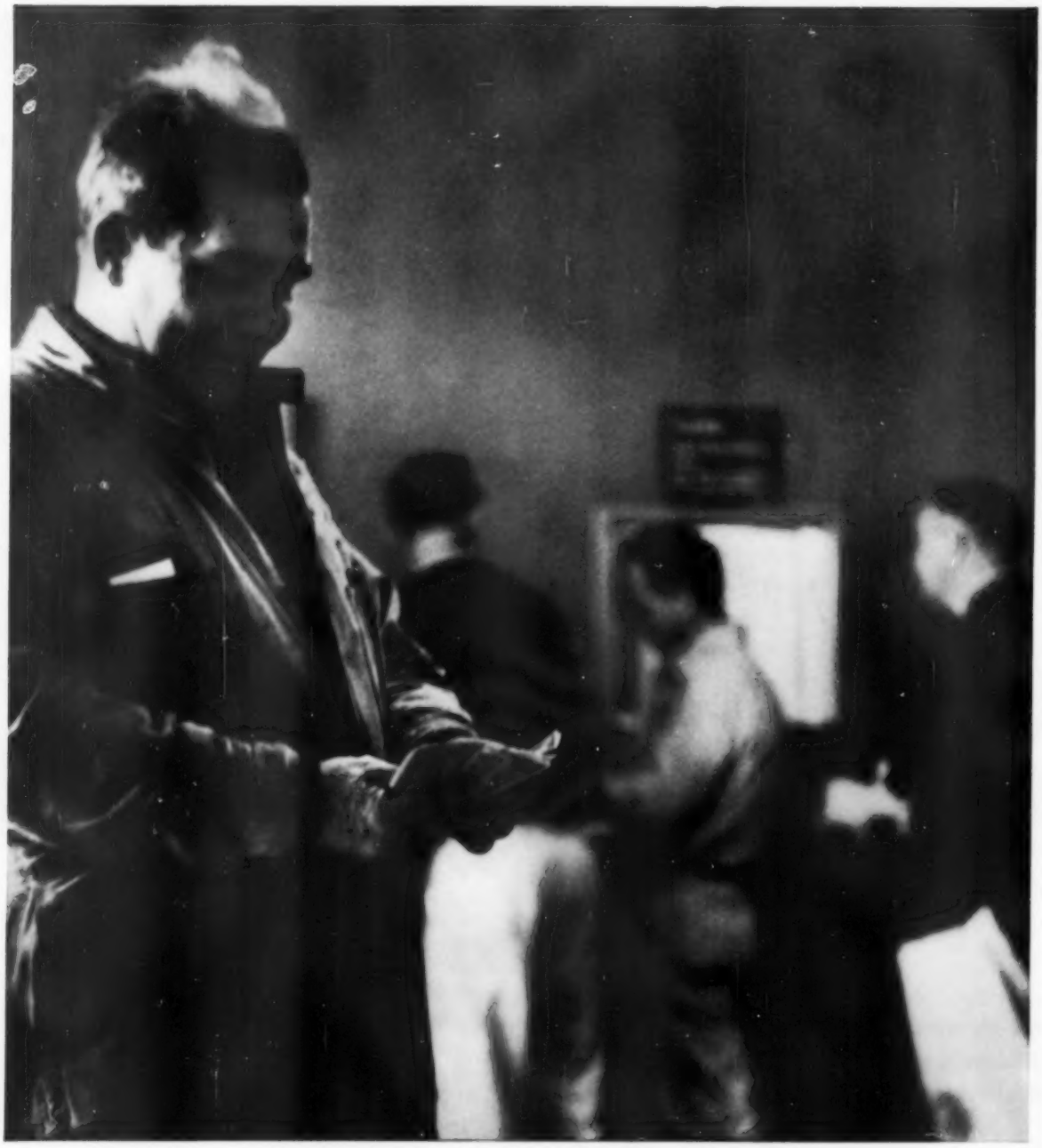

"Americans getting their weekly pay checks from the production of merchandise for foreign markets number many more than are liable to be displaced by imports from other countries. The encouragement of trade with all the countries of the free world is a basic ingredient for peace."

—*Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)*

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STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Tidewater Oil Company's 200 million dollar refinery near Wilmington, Delaware. Six of its eleven processing units are largest of their types ever built!

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TIDEWATER REFINERY

Here's Why Square D is Your Logical Choice, too!

INCREASED SAFETY! • Bus bars fully enclosed, rigidly supported and have ample cross section. Circuits isolated by individually enclosed plug-in units. Disconnect handle gives maximum operator protection.

FLEXIBILITY! • Individual plug-in units or complete sections easily added, removed or exchanged. Pushbuttons, pilot lights, and selector switches readily added to unit doors.

INSTALLATION ECONOMY! • All wiring channels are large and accessible from front without removing units. No "wire fishing."

SPACE ECONOMY, TOO! • Up to six combination starters fit in a 20" x 90" section. Plug-in unit heights designed in space-saving increments of 3".

SUPERIOR DESIGN you can actually see and feel. Practical, modern styling. Greater structural strength gives more rigidity and assures precision alignment.

Write for CONTROL CENTER BULLETIN...
Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

(Top photo) In the refining area **Square D Control Centers** provide a portion of the centralized control of pumps and compressors. In the maintenance shop they control power, heating, ventilating and lighting.

(Lower photo) Another Square D Control Center, located in the Employe Relations Building, provides pushbutton control of air-conditioning units and compressors. Infirmary X-Ray equipment and parking lot lighting also are remotely controlled from this Center.

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SQUARE D COMPANY

Wheatland Steel Pipe means Quality

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Wheatland gives you the finest quality steel pipe made. But Wheatland means a little *more*. It means people —men who have made pipe their life . . . your satisfaction their ultimate goal. The cold steel pipe they produce has warm concern behind it.

Yes, we sincerely believe you get *a little more* from Wheatland. Try us and see!

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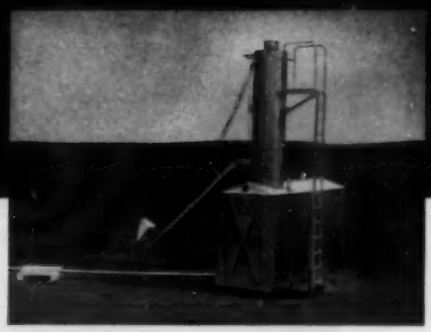
Proven

IN OVER 500 INSTALLATIONS

ROLO'S CALCIUM CHLORIDE

Gas Dehydrator*



--the revolutionary dehydrator that requires no pump or process heater

The San Juan Basin, Big Piney and the provinces of Alberta and Saskatchewan are among the cold weather areas that have served as proving grounds for the Rolo $CaCl_2$ Gas Dehydrator. Under wintery conditions, efficient gas dehydration is all the more essential, but far more difficult to achieve. Yet, the hundreds of Rolo Units in these areas have performed with marked success.

The Rolo Calcium Chloride Gas Dehydrator employs a long-lasting bed of calcium chloride to remove water vapor from gas streams. Top efficiency is obtained by utilizing the continuously-formed brine, in a series of patented jet trays, to pre-dehydrate the gas before it contacts the chemical bed.

Advantages over competitive systems:

SIMPLICITY . . . No pumps, since regeneration is not required. Only moving parts are the level controls.

LESS HAZARDOUS . . . No process heat required, since there is no regeneration.

ATTENDANCE-FREE . . . Absence of pump and regenerative heater allows unattended operation for long periods—especially important in cold areas and offshore.

LOW OPERATIONAL COST . . . Cost per MMCF is low in comparison with other systems.

LOW INITIAL COST . . . Get our prices and compare.

MAXIMUM DEWPOINT DEPRESSION . . . The ability of calcium chloride as a dehydrating agent, especially with utilization of the brine, is unequalled in water vapor removal.

INTEGRAL SCRUBBER . . . Standard on all models; removes free liquids from the incoming stream.

The Rolo Calcium Chloride Gas Dehydrator is the dehydrator of the future. If *your* wells require dehydrators, it will pay you to consider this unit. Write for details, sending data on operating conditions if a specific recommendation is desired. Or, contact the Rolo representative in your area.

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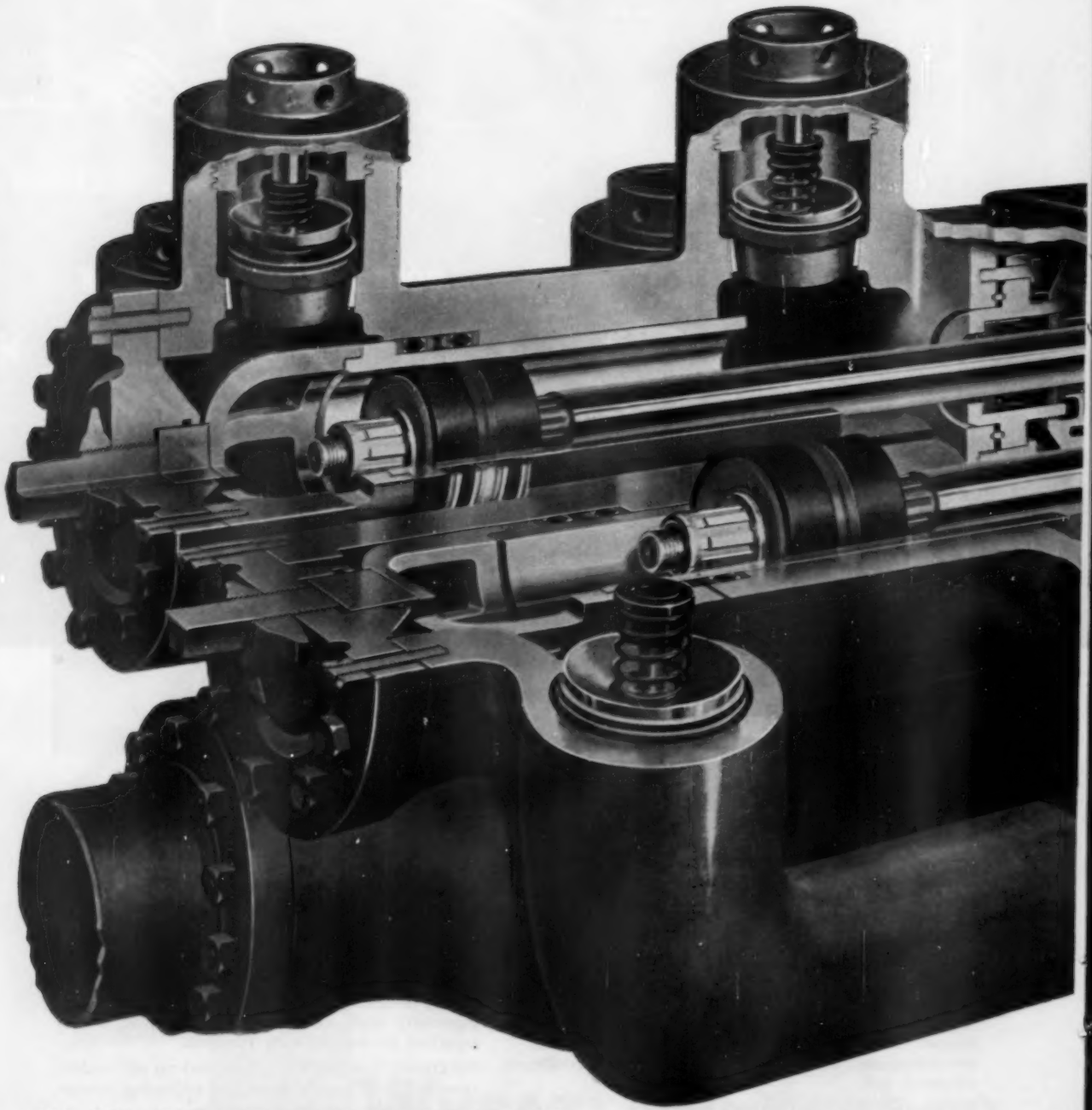
The "Inside Story" of the Heart



Since fluid-end pump parts must be correctly maintained for longest service, Mission has prepared a special Pump Maintenance Manual for your benefit. Write for your copy today!

PISTONS • PISTON RODS • SLIPS • GLAND PACKINGS • LINERS • LINER PACKING
PUMP VALVES AND SEATS • SWABS • VALVES • HAMMERDRILS • CENTRIFUGAL PUMPS

# of Your Rig ..... by MISSION

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WE MADE THIS cutaway view of a mud pump so you can see just where the vital fluid-end parts fit and why they are essential to correct operation. Your mud pump is one of the hardest working parts of your rig. Forces on these fluid-end parts are staggering. For example, pistons and rods may be subjected to forces of more than 100,000 pounds. These forces may be multiplied by shock loading at times, and they are completely reversed at least once every second. When you remember that mud may contain abrasive sand to cut metal parts; corrosive chemicals to pit them, and oil to attack rubber, it seems obvious that only the best pump parts stand a chance.

LIKEWISE, MISSION MUD PUMP VALVES AND SEATS may withstand pressures ranging from a near vacuum to well over 3,000 psi. In addition to other severe conditions, valves are required to seal perfectly even though mud may be loaded with all types of lost circulation materials.

In this service, only parts of advanced design and materials can stand up. That's why Mission has been a leader in pump parts research for many years.

But, most important, Mission pump parts are built to be used together to give even longer service. Here are some concrete examples.

MISSION PISTONS AND MISSION LINERS work together. Each depends on the other for trouble-free operation.

Both liner and pump bore depend upon the liner packing for freedom from fluid cutting. *MISSION SUPER-SERVICE® LINER PACKING* features exclusive "zero clearance" confinement of packing rings that multiply packing life many times.

Furthermore, accurate machining of the liner outside diameter of Mission Liners means longer life for packing.

Now consider the connection between Piston and Rod. Each depends on accurate taper, precise alignment and correct surface finish of the other. Our gaging procedures are designed and maintained to insure the required accuracy for positive interchangeability of both piston and piston rod tapers.

PISTON RODS AND GLAND PACKING depend on each other for satisfactory service. From an economic standpoint, *MISSION SUPER-CHROME PISTON RODS* and *MISSION SELF-SEALING GLAND PACKING* make an unbeatable combination. The pressure-seal feature of the packing extends rod life while the non-pitting chrome surface of the rods extend packing life.

Now look at Valve Seats. The correct size, taper and surface finish of the seat can prevent costly pump deck washouts. Mission employs some of the most modern manufacturing and quality control techniques to assure perfect tapers.

When you consider that these Mission Pump Parts are in direct working contact with the drilling fluid, it is easy to see that they are vital to correct pump operation. When you remember that they work together for trouble-free service, it makes sense to specify all Mission pump parts—exclusively—in all your pumps. Your pumps will perform better, require fewer repairs and cost less to maintain when you do. The famous Mission Guarantee assures you of this service.

Nothing but the finest will bear the name of MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO., P. O. Box 4209, Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
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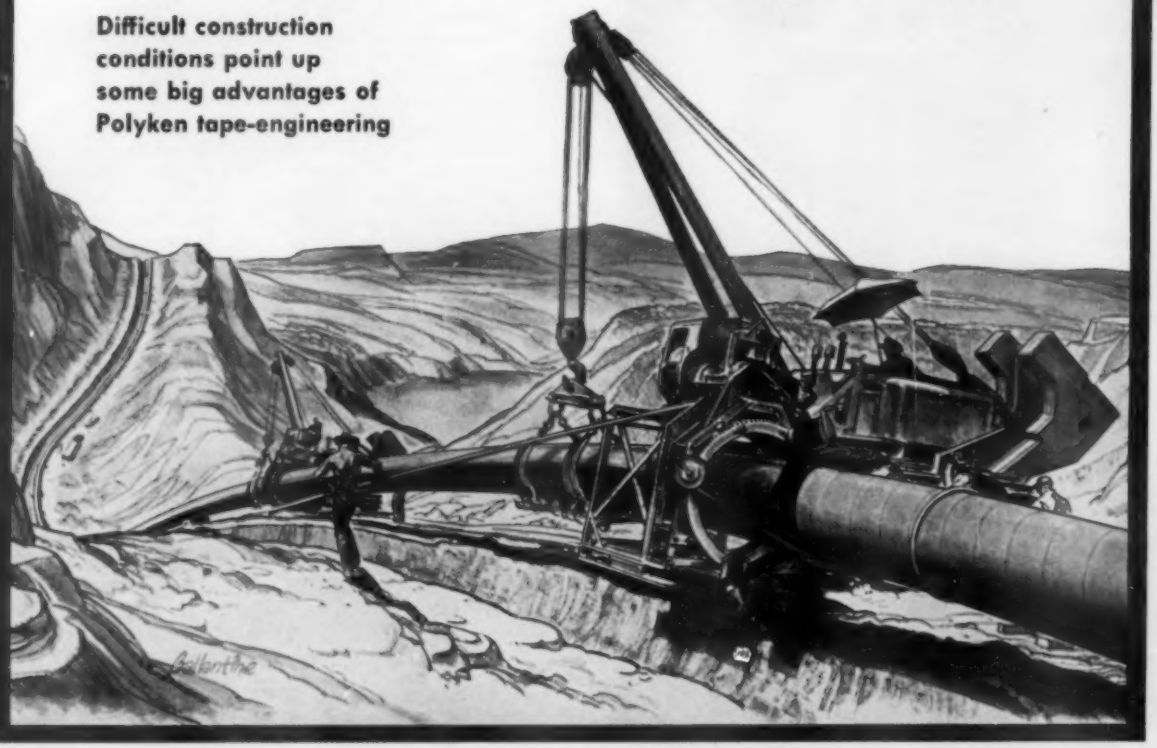
Why do Canadian spreads coat with Polyken tape?

(the proven polyethylene tape)

Difficult construction conditions point up some big advantages of Polyken tape-engineering



Canadian pipeliners have learned their business the hard way. That's why many have turned to Polyken tape and Polyken know-how—for proven results like these:

1. Substantial labor and equipment savings due to simplified operation.

2. Faster construction—consistent high daily output.

3. No hot dope preparation—tape is always ready.

4. No drying or cooling time. Simple clean-wrap-and-lower operation makes for a tight spread and closer supervision.

5. Vastly reduced warehousing, shipping, handling costs.

6. Liabilities virtually eliminated—no fumes, no burns, no need to worry about human and livestock hazards.

7. Wrap goes into ground in factory-uniform condition.

Today, considering the construction economies regularly reported, you just can't afford to overlook the Polyken method.

Polyken®

Experienced in modern PROTECTIVE COATING

THE KENDALL COMPANY

Polyken Sales Division

If you would like to know more about proven *Polyken protection, contact Polyken Sales Division, Dept. OG8, 309 W. Jackson Blvd., Chicago 6, Ill.*

At our Bethlehem Supply stores, nothing is quite so important as pleasing the customer. We try to anticipate his preferences, his choice of brands, his buying habits. We strive to be ready when he's under pressure and requires extra service.

Often he hurries into the store and wants his order put together in nothing flat. We can usually accommodate him. Bethlehem stores are geared for emergency demands. But when he can take his time, and decides he needs a breather, we do our best to make him feel at home.

Bethlehem now has 58 stores in 13 states and Canada. All stock brands of merchandise you've known for years. But the stores have something else in common—friendly, personal service, no matter how small the customer's needs. Sound like something you've been looking for?

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BETHLEHEM SUPPLY

PROVED AND PREFERRED...

Timken-Detroit® Axles are the Accepted Standard!

Timken-Detroit Heavy-Duty Tandems Are First Choice With Big Off-Highway Operators!

These superior features make the difference:

"Cradle Ride" Suspension. Free ends of long, resilient springs float in axle spring guide brackets. This permits axles to articulate freely, compensating for road irregularities. Floating springs cradle the vehicle, materially reducing road shock and eliminating source of vehicle flutter. *The load is more stable . . . driving is easier, more restful, safer.*

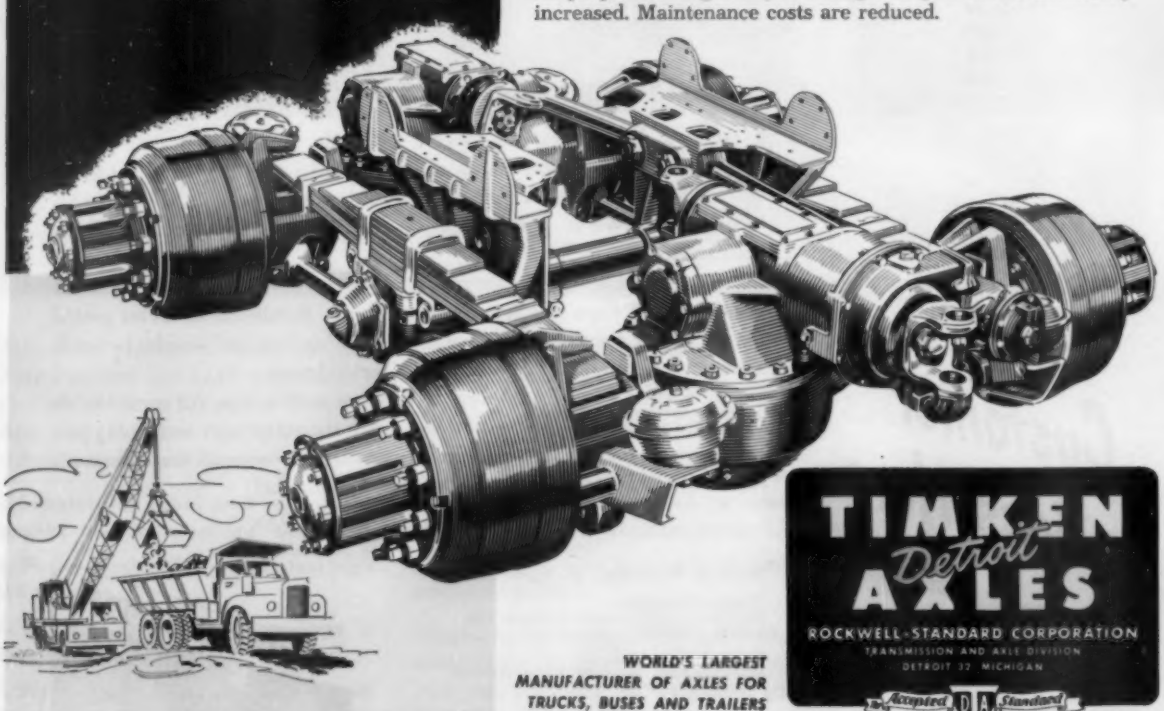
Hypoid Gears. Larger pinions and greater tooth contact give 30% more torque capacity, top efficiency and long life . . . *plus lower maintenance costs.*

Driver Controlled Inter-Axle Differential. Torque is divided equally between axles, yet wheels of one axle can turn faster or slower than wheels of other axle. This means both axles are always doing equal amounts of work. *Driving parts and tires last longer.*

Hot Forged Rectangular-Shaped Axle Housings. Rectangular shape, combined with full strength corner sections, provides the greatest strength with minimum weight and size. Welded-on bowl cover prevents leakage.

Torsion Flow Axle Shafts. More splines, plus greater root and body diameter, add extra strength.

Straight-Line Through Drive. Straight through drive eliminates all prop shaft angularity. Bearing and gear life is materially increased. Maintenance costs are reduced.



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They Say—

For easier reference

Dear Sir:

I wonder if you would mind my making a suggestion which might be helpful to the users of your Journal after it is bound?

The suggestion is to include the issue number on every other page. It is customary for users in noting references to current Journals to include the issue number when needed rather than the month and date. Later, after the volume of the Journal is bound, the user can return to it easily from his notes.

I know that you cannot accept all suggestions, but believe that this one would be helpful to all of the users of The Oil and Gas Journal and would help our users and us in citing your journal.

Charles L. Bernier
Executive Associate Editor
Chemical Abstracts Service
Ohio State University
Columbus, Ohio.

(Editor's note: We agree that this change would be helpful to those using OGJ as a reference. Beginning December 15, the Journal will include the issue number on every other page.)

Behind the Borden report

Dear Sir:

Your editorial of November 10 started by admitting lack of knowledge to comment on the Royal (Borden) Commission and then proceeded to elaborate on how far out of line the report seemed to be.

For your information, the commission hearings were a direct result of the importation of about 45% of the crude oil and products consumed in Canada while Canadian fields are severely prorated.

This condition has prevailed for many years in spite of adequate Canadian crude reserves which were and are capable of meeting the Canadian market requirements without adding to consumer prices anywhere in Canada.

The natural resources of Canada are primarily government owned and are administered very similarly to U. S. resources under the Department of the Interior. For this reason free oil enterprise cannot be expected to prevail unless free enterprise assumes the responsibility of using the available resources to meet local market demand.

It so happens that free enterprise has for various and valid reasons elected to import what might be considered excessive amounts of the crude and products consumed in Canada. The natural reaction to this performance is suggested government control.

J. A. McCutchin
Whitehall Canadian Oils, Ltd.
Calgary.

No slip of the editor

Dear Sir:

I have been reading The Oil and Gas Journal during the past years with great interest as I consider it a well-versed publication on oil matters throughout the world.

In October I received the shock of my life to see how it (the Journal) was losing contact with the outside world—namely a little article published by Mr. Paul Hall, Goliad Corp., Houston, in the October 6 edition (p. 93).

I wish to consider this article a slip of the editor, or of the proofreader, as I think The Oil and Gas Journal knows better than to print untrue statements.

Savages, the dictionary says: Untamed, uncivilized, fierce. Human being in a wild state. Brutal person.

Therefore, I invite the editor to spend a few days in Venezuela and visit the various oil companies and take up a census from the executive department on down to determine the number of savage descendants. The training of savages into executives would be a very interesting fact for the scientific world.

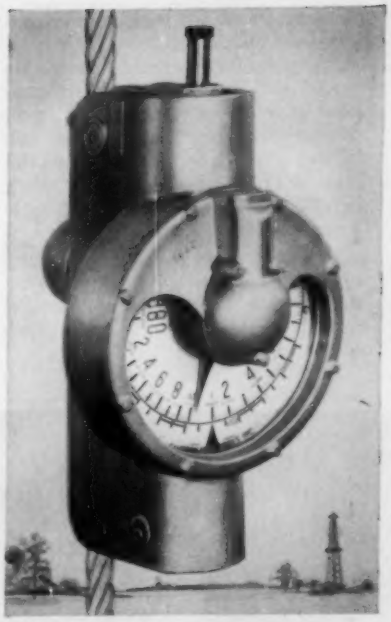
Articles like these are the ones which cause ill feelings.

Mary Johnson
Creole Petroleum Corp.
Maracaibo, Venezuela.

(Editor's note: Writer Hall's letter was intended as a compliment to the oil companies for their work in building the economies and adding to the culture of various world areas. The Journal might disagree with his choice of words, but we were not privileged to change them.)

Government in conservation

"The instrumentalities of government—federal, state, and local—must



STRAIGHT DOWN DRILLING

For faster, straighter hole, the tough Cameron Type "C" Weight Indicator has no equal. Temperatures in the field change abruptly from tour to tour but the Cameron Type "C" Mechanical Weight Indicator continues to register—accurately and dependably. The reason is simple—Cameron Weight Indicators have no hydraulic system to pick up or lose pressure with temperature changes. There is no possibility of breakdown due to leakage of high pressure fluids. The large yellow dial of the Type "C" with bold contrasting black and red numerals makes the indicator readily visible from any point on the rig floor. The indicator case is oil-filled (like the Cameron pressure gauge) to provide a viscous damping of dial motion and to prevent damage from vibration.

Give one a try. Your bits will bite into any formation with exactly the right pressure for peak drilling efficiency. All bottom hole operations requiring precise weight control will be easier if you COUNT ON CAMERON Type "C" Weight Indicators.

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by necessity assume leadership in conservation endeavors.

"However, government leadership should not be allowed to deteriorate into government domination; nor should government leadership be utilized as a device to relieve private citizens or private enterprise of their rightful responsibilities in resource conservation."

Elmer F. Bennett, Under Secretary of the Department of the Interior, in a speech to the Independent Petroleum Association of America, Dallas.

World reserves in one gulp

"If everyone else in the world outside the United States suddenly began to use as much oil per capita as we do, the world's present known oil reserves would be used up in less than 5 years."

D. T. Staples, chairman of the board, Tidewater Oil Co., in a speech to Phoenix, Ariz., area Kiwanis Clubs.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

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METER RUNS
MECO Standard Meter Runs conforming to A.G.A. specifications are made in our own fabricating shop of materials carried in stock. —Seamless steel pipe, Tube Turn welding fittings, Forged steel flanges, and Commercial Orifice fittings. Meter Runs are available bored and honed, coated bore for corrosive service, and to special designs.
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MAINTENANCE
Mechanical CORPORATION

CALENDAR OF EVENTS

DECEMBER

8-10 American Management Association, seminar on management problems of exploration and production, Ambassador Hotel, Los Angeles.

9-10 University of Oklahoma, third annual course in water-quality control for subsurface injection, Norman, Okla.

9-13 National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.

11-12 Mid-Continent Oil and Gas Association, annual ad valorem tax forum, Hilton Hotel, Fort Worth.

JANUARY

12-14 Pipe Line Contractors Association, eleventh annual convention, Americana Hotel, Miami Beach, Fla.

12-16 Society of Automotive Engineers, annual meeting and engineering display, Sheraton-Cadillac and Statler hotels, Detroit.

16-17 Association of Oilwell Servicing Contractors, annual meeting, Baker Hotel, Dallas.

22-24 Texas Society of Professional Engineers, annual convention, Shamrock Hilton Hotel, Houston.

23 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

26-29 Tenth annual plant maintenance and engineering conference, sponsored by Clapp & Poliak, Inc., Public Auditorium, Cleveland.

28-29 Annual Midwest Welding conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, and American Welding Society, Chicago section, Illinois Institute of Technology, Chicago.

30-31 Oklahoma Society of Professional Engineers, annual meeting, Mayo Hotel, Tulsa.

FEBRUARY

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.

2-27 Southwestern Legal Foundation, short course on oil and gas law, Southwestern Legal Center, Dallas.

9-11 American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.

11-13 Southwestern Legal Foundation, tenth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

11-13 National Association of Corrosion Engineers, Tulsa section, tenth annual pipeline corrosion short course, Mayo Hotel, Tulsa.

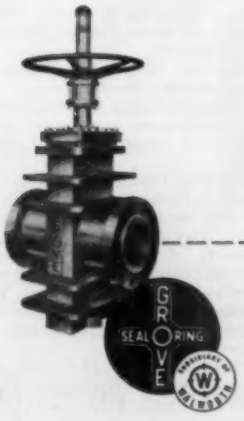
15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

16-18 American Management Association, seminar on management problems of exploration and production, Hotel Astor, New York.

24-25 University of Oklahoma, sixth geological symposium, Norman, Okla.

27 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

.....wipe out the need for lubrication



Lubrication problems are wiped out with the squeegee action of the exclusive Grove Seal-O-Rings. Up or down movement of the gate through the floating seats cleans and polishes both upstream and downstream surfaces. Foreign matter which could cause sticking, distortion, or abrasion is removed. The "O" Rings provide smooth action through the seats and bubble tight pressure seals on both sides of the gate. Specify Grove Seal-O-Ring Gate Valves. When they're set you can forget about lubrication or sealing compounds forever.

Grove valves never require lubrication

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26-28 Pipe Line Contractors Association of Canada, fifth annual convention, Castle Harbour Hotel, Bermuda.

MARCH

3 Petroleum Equipment Suppliers Association, Pacific district, annual membership meeting, Ambassador Hotel, Los Angeles.

9-11 Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.

11 Petroleum Equipment Suppliers Association, southwestern district, annual membership meeting, Shamrock Hilton Hotel,, Houston.

13 American Institute of Chemical Engineers, Sabine area section; American Chemical Society, Texas-Louisiana Gulf section; sixth annual joint technical meeting, Lamar State College of Technology, Beaumont, Tex.

16-18 Western Petroleum Refiners Association, forty-seventh annual meeting, Hilton Hotel, San Antonio, Tex.

16-18 Society of Automotive Engineers, national passenger car, body, and materials meeting, Sheraton - Cadillac Hotel, Detroit.

18 Petroleum Equipment Suppliers Association, eastern district, annual membership meeting, Duquesne Club, Pittsburgh.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.

19-20 New England Gas Association, annual meeting, Hotel Statler, Boston.

25-27 American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

APRIL

2-3 Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.

2-3 American Institute of Mining, Metallurgical, and Petroleum Engineers, technical conference on stress corrosion, Mellon Institute, Pittsburgh.

6-7 Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis.

5-10 American Society of Mechanical Engineers, nuclear congress, Cleveland Auditorium, Cleveland.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland.

15-17 American Petroleum Institute, Division of Transportation, annual tanker conference, Jung Hotel, New Orleans.

19-23 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Shamrock-Hilton Hotel, Houston.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

MAY

1 Fourth annual petroleum accounting conference, sponsored by Wichita chapters of the Petroleum Accountants' Society of Kansas, National Association of Accountants, the Kansas Society of Certified Public Accountants, and the University of Wichita; Lassen Hotel and University of Wichita campus, Wichita.

3-6 Liquefied Petroleum Gas Association, twenty-eighth annual meeting and trade show, Conrad Hilton Hotel, Chicago.

4-7 American Geophysical Union, annual meeting, Washington.

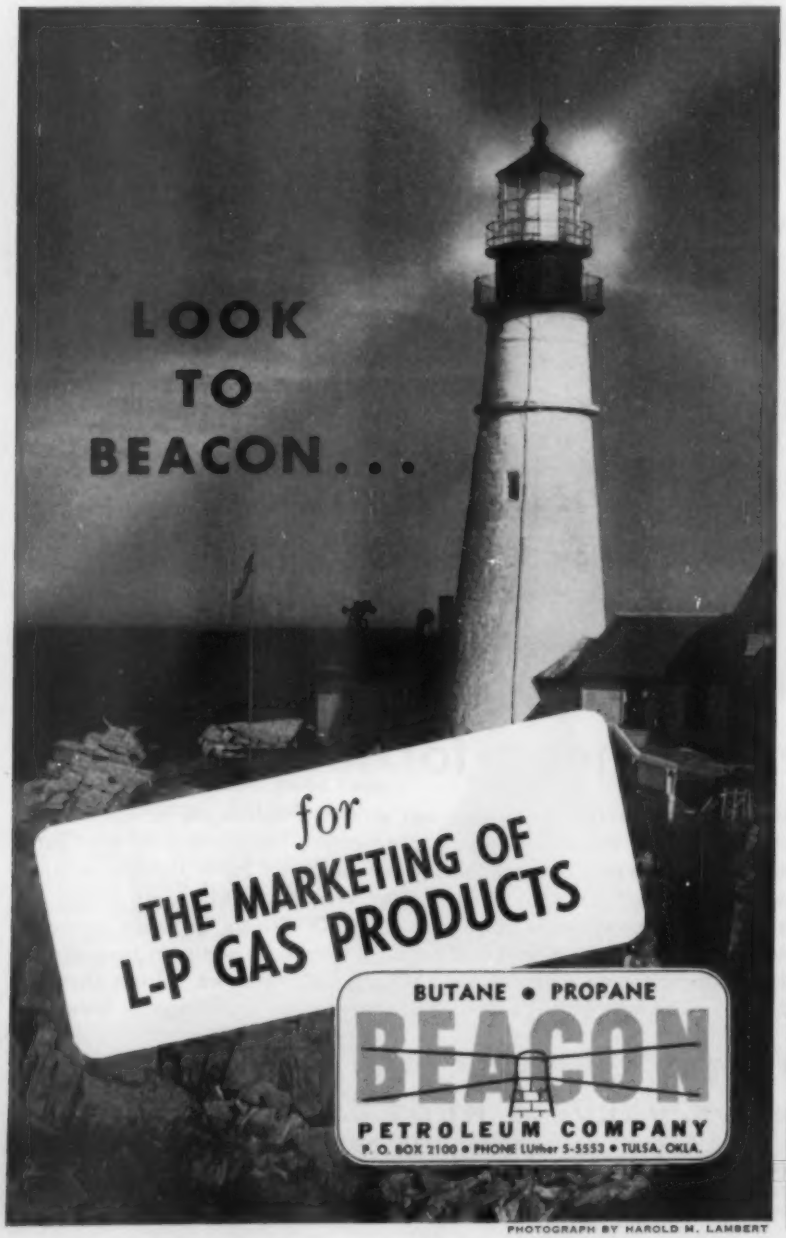
5-7 Purdue University, fourteenth Purdue industrial-waste conference, Purdue Memorial Union Building, Lafayette, Ind.

6-8 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

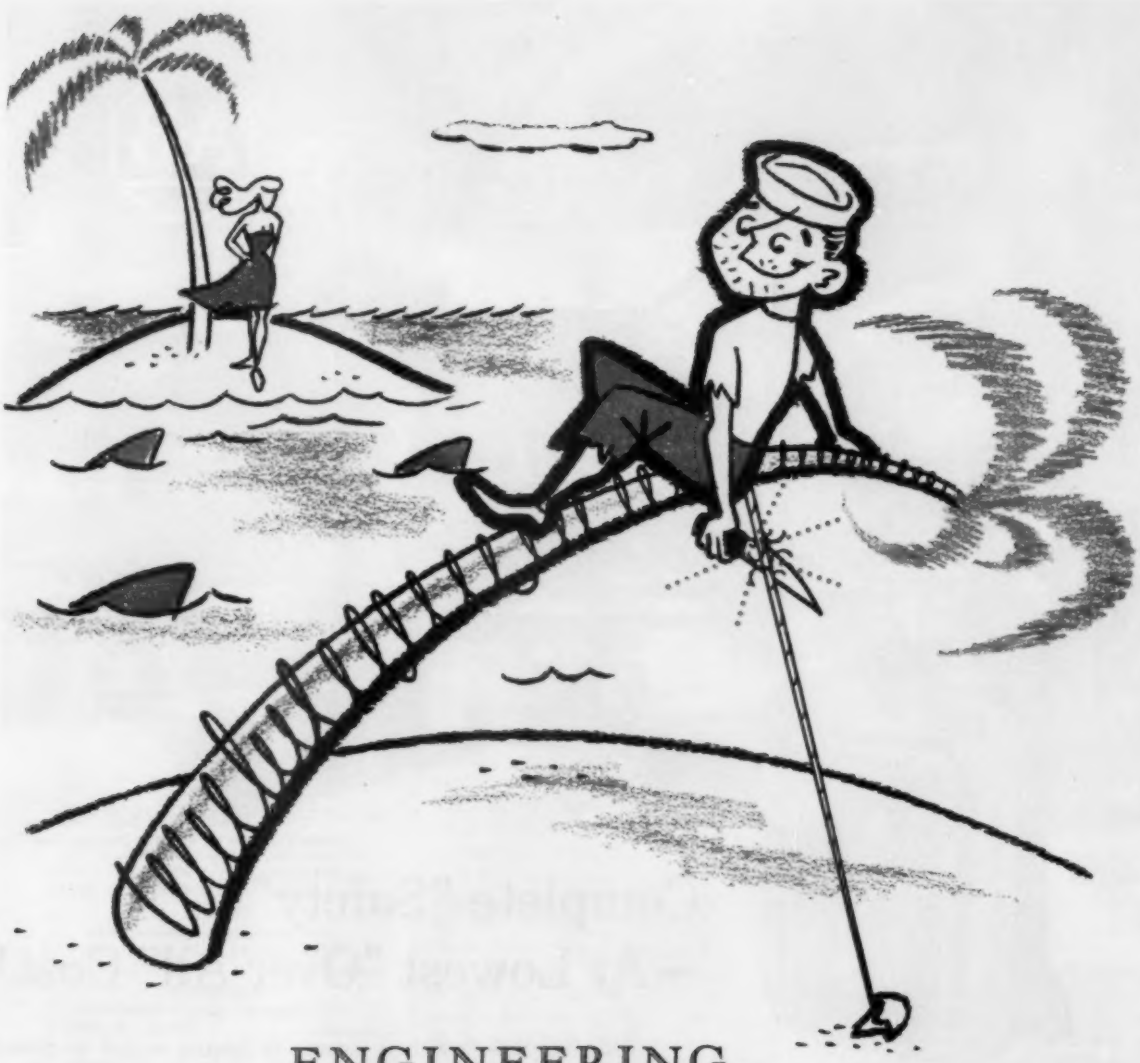
7-8 Society of Petroleum Engineers of AIME, Permian Basin section oil recovery conference, Midland, Tex.

13-15 American Petroleum Institute, Division of Transportation, annual pipeline conference.

25-27 Chemical Institute of Canada, forty-second annual conference, Halifax, N. S.



PHOTOGRAPH BY HAROLD M. LAMBERT



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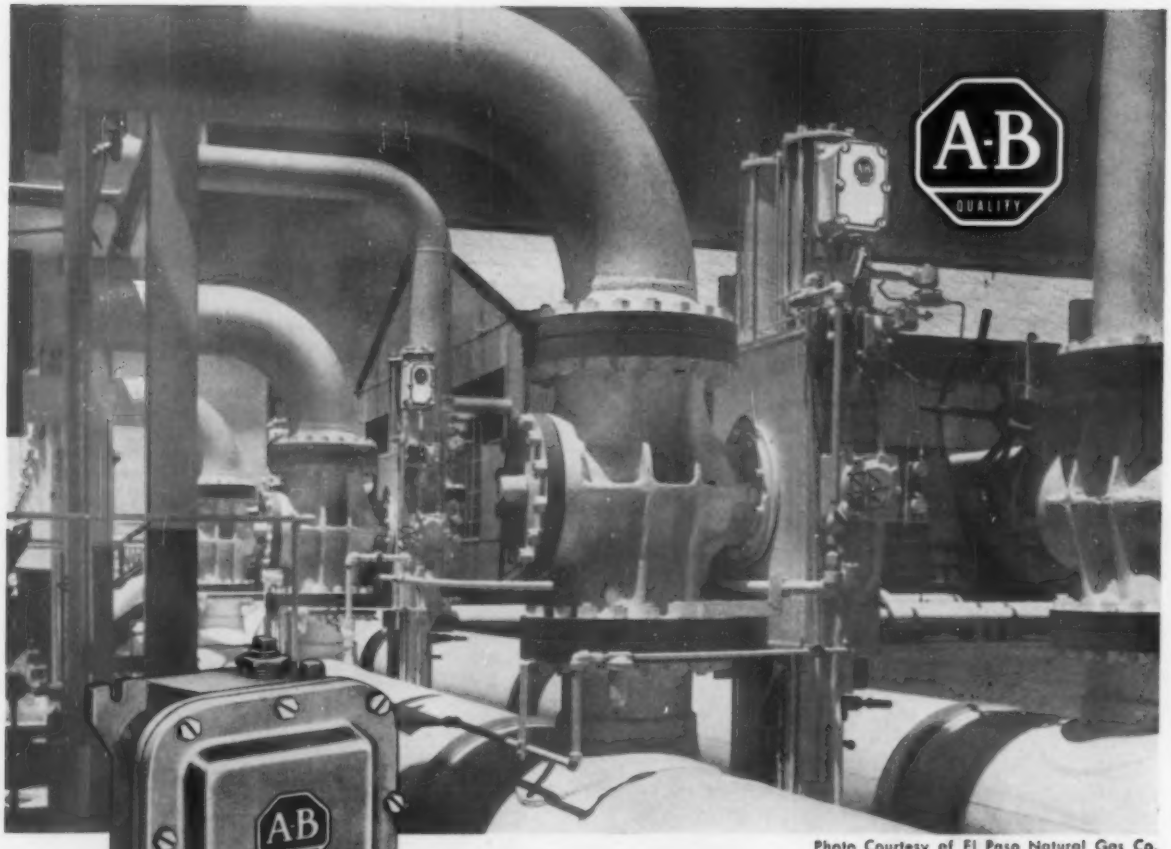

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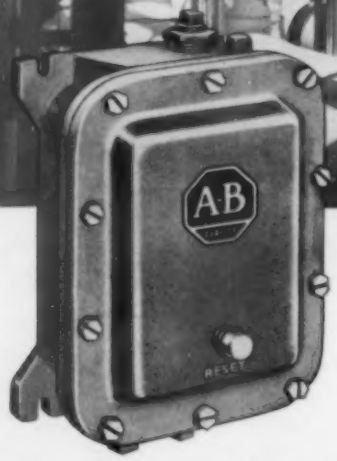
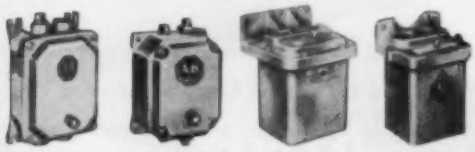


Bulletin 709 Size 1 Solenoid Starter in NEMA Type 7 enclosure for hazardous gas locations.



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JOURNALLY SPEAKING

Adz in W. (BG) Va.

A FEW WEEKS AGO (in the October 20 issue, to be exact) this column carried a squib about rig builders, speculating that today's young petroleum engineers probably never heard of the term.

The item was calculated to arouse nostalgic reminiscences among the veterans in the business, and it did just that.

A week or so later we got a letter from a geologist in Duncan, saying:

"Yes, there still are rig builders, because they have to erect derricks to dig those deep wildcats. Of course, it takes only a day or so to erect a derrick now.

"Back in the early twenties here in southern Oklahoma it used to be a sight worth witnessing to watch a rig-building crew erect one of those 96-ft. derricks in a day.

"That was in the days of 6-in. drill pipe and 20-ft. joints where you stacked the drill pipe in the derrick in 'thribbles.' Then they went to 4-in. drill pipe and 30-ft. joints so they built 122-ft. derricks and it sometimes took a day and a half to erect one of those wooden derricks.

"The steel derricks started, I think, in the beginning of the thirties, and the same old crews erected them. Then they cut them down to 'pumping-derrick' height (64 ft.) for well servicing.

"It was during the Illinois boom in 1938-40 that the portable unit and mast came into being. Demands of the rig builders in that highly unionized coal country became excessive and they ran themselves out of business.

"That demand for higher and higher wages probably also brought on the well-servicing unit with its telescoping mast, so that no derrick is ever necessary on the majority of wells.

"Economics and the law of supply and demand are forces that cannot be legislated and are powerful forces over our ever-improving economy."

Well, that fellow thought he was an old-timer in the oil business, but he doesn't hold a candle to an operator in Shreveport whose recollections go back so far as to make rig-building operations of the twenties look like sissy stuff.

He wrote:

"I am sure that 'rig builders' are new names to certain of the newer, or newest, generation of oil people, but the rig builders described in your comments are of themselves 'Johnny-come-latelies' to the not-at-all-gentle art of rig building.

"True, I am not able to go back to the beginning of this art (and art it was), but I do go back a long ways before the time when 'a lumber yard would deliver a big pile of boards and timbers to the well site.'

"That must have been Oklahoma days, as there is no natural timber there. But back in West (BG) Virginia, when I was introduced to the oil business by Carter Oil Co., it was different.

"True, there was a certain amount of lumber from a mill, but the rig builders also cleared the ground for the derrick and used the big trees they felled for sills and the ground timbers.

"The big oak trees were used for the shafts of the bull wheels and calf wheels and it was something to watch those rig builders, with axe and adz, shape those shafts until they ran true.

"No, I agree with you, the Rig Builder, the Mule Skinner (and no one who ever argued the right of way with a Mule Skinner would fail to capitalize that name) are all of the past era.

"Also, for that matter, might be classed the Oil Scout who scouted wells and was not simply a reporter.

"But when you do pass upon the rig builders, please get back to the times when they were artisans in the oil business."

Oh, the heck with that. This fellow has slanted our curiosity in another direction with his reference to "West (BG) Virginia."

Until we find out the meaning of those two initials stuck right in the middle of the state's name we aren't going to waste any research on such less-intriguing subjects as mule skinners' vocabularies or the old-time rig builders' art with an adz.

—Henry D. Ralph

Another successful use for BAKER Packers... parallel string installations

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FEATURES

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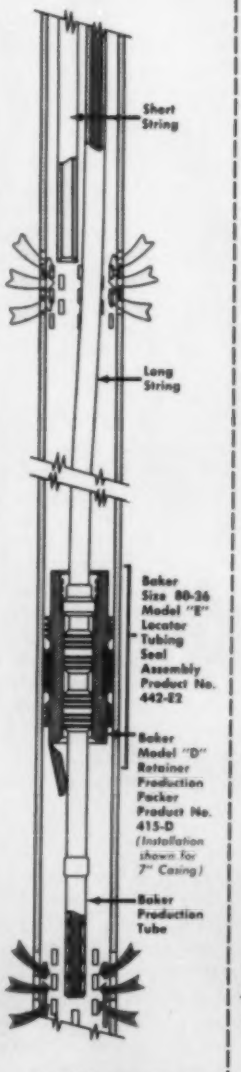
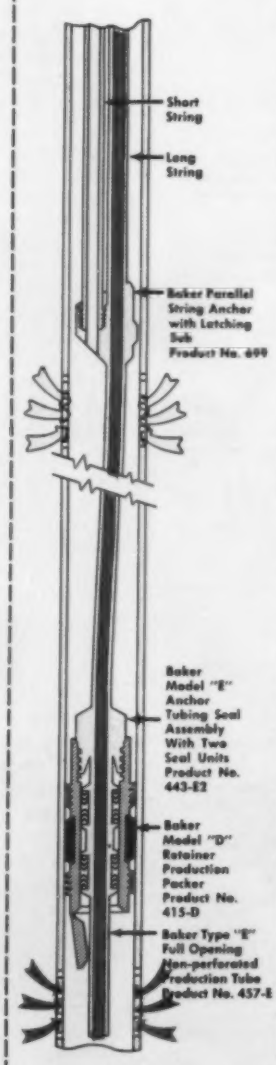

Short String
Long String
Baker Size 80-36 Model "E" Locator Tubing Seal Assembly Product No. 442-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

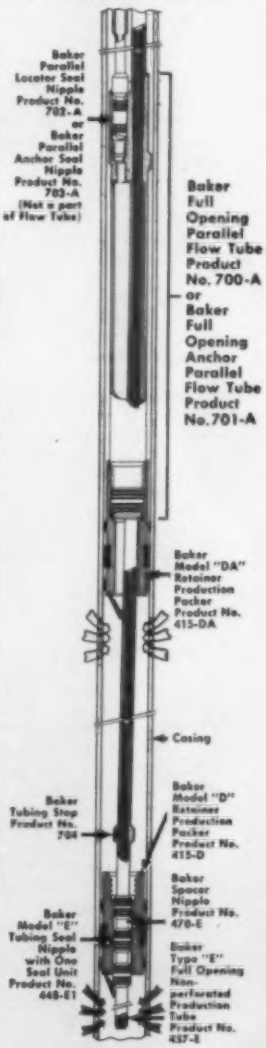
DUAL ZONE parallel string SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 699
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

DUAL ZONE parallel string TWO-PACKER HOOK-UP*

**Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.*


Baker Parallel Locator Seal Nipple Product No. 702-A
or
Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A
or
Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
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Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

New approaches are needed to justify depletion

NEW thinking and new action in defense of the depletion provision of the federal tax law are needed by the oil and gas industry.

The explanations and justifications that have been used successfully in the past seem to carry less weight today. The opposition has gained much ground, and the industry's supporters in Washington appear to be getting fewer and less confident of their position.

This is evidence that many of the old arguments no longer sound convincing. Opponents have what they consider sufficient answers, and their repeated attacks endanger continuation of the formula.

SO IT IS GOOD that the Interstate Oil Compact Commission has created a committee to study how an increase in the industry's tax burden would affect conservation and recovery of oil from presently known reserves.

This is an aspect of depletion that has been neglected. Statistical studies are needed to show how loss of the 27½% rate would result in premature abandonment of stripper wells and deny operators the funds to install secondary-recovery projects.

Heretofore the industry has been successful in defending depletion as offsetting the tremendous risks in wildcatting. That argument is less convincing now that the nation has surplus producibility.

Furthermore, opponents are making converts with their contention that oil operators have developed other ways of hedging the hazards of wildcatting so that they may incur little more risk than other types of business. It will take new factual material to refute that contention.

Also, the public should be made to realize that a major portion of its future oil supply will come through greater recovery from fields already discovered—but that new recovery methods will not be developed and applied unless the operators get an economic payout after taxes.

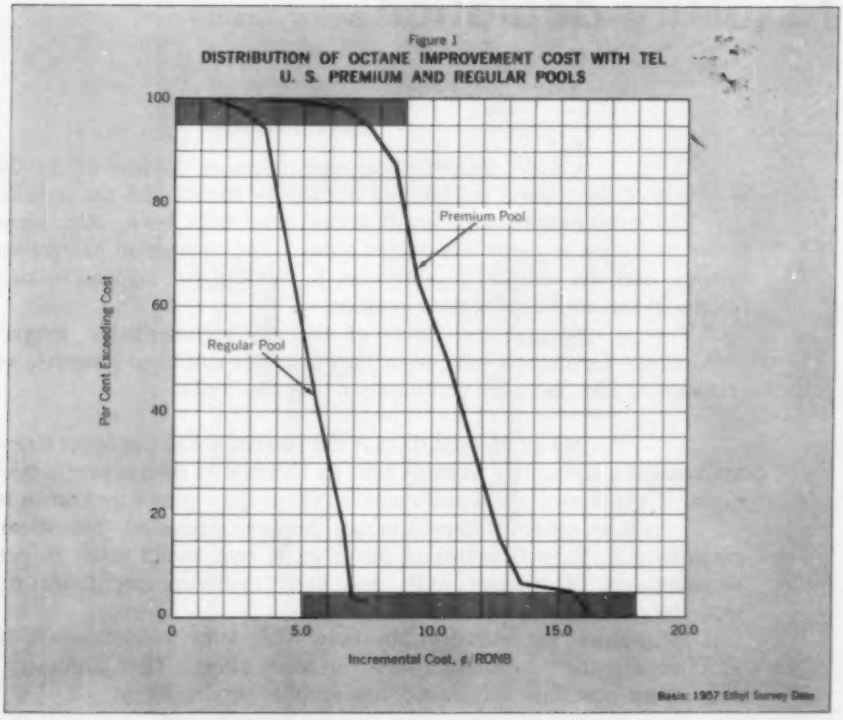
THIS IS A PROBLEM that requires the cooperation of the entire oil and gas industry. Generalities must be documented with facts and figures. Individual operators and companies must supply material for case histories and industry-wide compilations of what happens to the capital returned to them through the depletion provision.

Opponents have been able to use the tax status of a few selected operators as horrible examples of "tax evasion." This must be offset by proof that the industry as a whole uses its depletion allowance to increase the nation's producible reserves and keep oil prices at reasonable levels.

Finally, the industry must become more articulate on the subject. Much of its defense has been intelligible only to economists and accountants.

What is needed is material that can be understood by, and be convincing to, congressmen, editorial writers, and others not versed in the intricacies of mineral economics and taxation principles.

New data on economics of octane improvement



Ethyl Research appraises the use of tetraethyllead in refinery gasolines; summarizes recent data

by C. J. WOLF—*Refinery Technology Division*

RESULTS of Ethyl's study of the economics of tetraethyllead in current refinery gasolines now are available to oil companies as a means of comparing octane improvement costs.

This annual statistical review by Ethyl Research Laboratories in Detroit also includes an historical picture of Fall refinery fuels for the past several years.

Data are presented nationally and for the Eastern, Midwestern, Southwestern, Rocky Mountain and Western regions.

1957 Sample Data Represent 80% of U. S. Crude Capacity

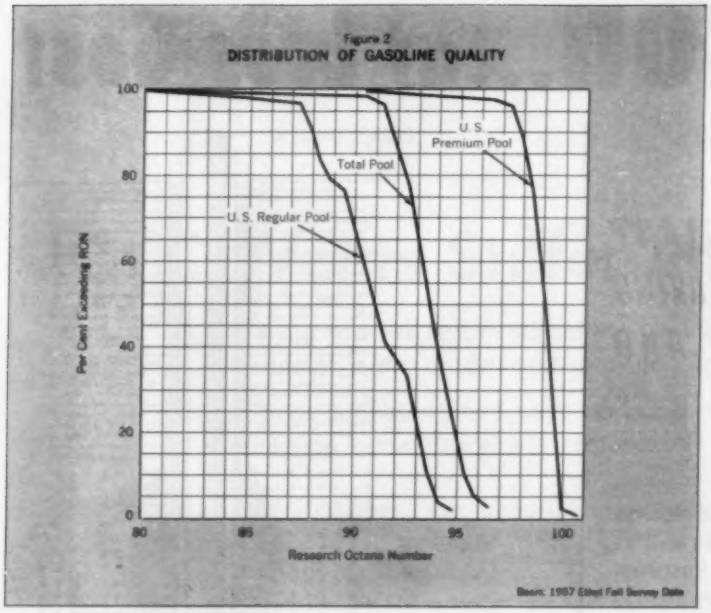
For this study, Ethyl's Fall survey of refinery gasolines was supplemented by data on additional fuel samples received by our Gasoline Testing Division from many independent refineries. Approximately 170 samples each of premium and regular fuels were processed, representing almost 80 percent of the crude running capacity in the United States.

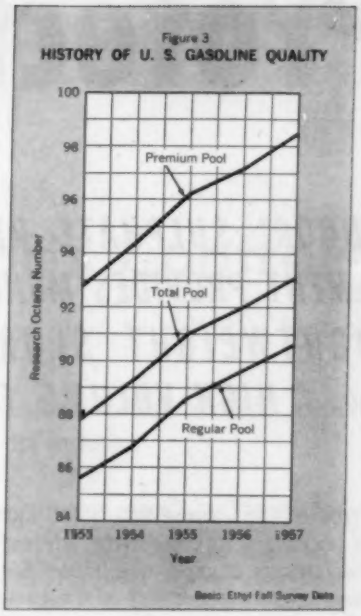
Each sample was weighted to reflect the crude running capacity of the refiner. Here are the weighted characteristics of the premium and regular gasolines and the combined pool in the United States.

	RON	TEL Conc. ml/gal.	¢/RONB as received	RON Gain due to 3.0 ml TEL
Premium	98.4	2.58	10.10	0.4
Regular	90.6	2.18	4.79	1.4
Pool	93.2	2.31	6.50	1.1

Octane Improvement Cost Calculations

The cost of octane improvement using tetraethyllead was determined in units of cents per Research octane





number barrel (¢/RONB). The following equation was used:

$$¢/\text{RONB} = \frac{42C\,(T+0.5)\,PN}{2800M}$$

Where

C=TEL cost, cents per milliliter
T=TEL concentration, ml/gal.
PN=performance number
M=TEL susceptibility

Tetraethyllead susceptibility data were developed for each sample from the antiknock quality on an "as received" basis and plus 2.0 ml TEL per gallon.

TEL Costs 3.5 to 15.0 ¢/RONB

Octane improvement costs using tetraethyllead are shown by the distribution curves in Figure 1. If the terminal five percent portions of the curves (shown as shaded) are not considered, the range of incremental costs is from 7.5 to 15.0 ¢/RONB for premium gasolines and 3.5 to 7.0¢/RONB for regular gasolines.

Current data indicate the costs of octane improvement by processes such as isomerization and aromatic extraction, or by increasing reformer severity, range from 12.0 to 20.0 ¢/RONB. It would follow then that these processes are economically justified for the production of premium gasolines but not for regular gasolines.

Trends in Gasoline Quality

Data from the years 1953 to 1957 show the significant increase in the antiknock quality of U.S. gasolines since 1953, but a lower rate of increase since 1955.

Other comparative data give the year by year trends on tetraethyllead concentration, possible gain in Research octane number due to 3.0 ml of tetraethyllead per gallon, tetraethyllead susceptibility, octane improvement costs, and sensitivity.

How Ethyl Research is helping you

Since 1953 Ethyl Research has made an annual appraisal of the economic status of tetraethyllead as a means of octane improvement. Data from these studies have been used as a statistical reference on refinery gasolines for both current and historical review.

Widespread interest has prompted Ethyl Corporation to summarize these data (1953-57) for the Petroleum Industry in report form.

Copies of the report, entitled "Economics of Tetraethyllead in Refinery Gasolines," are available from your Ethyl Representative or by writing Ethyl Corporation, 100 Park Avenue, New York 17, N. Y.

Further, if you would like to discuss octane improvement costs with one of our Refinery Technologists, your Ethyl Representative will be glad to arrange a meeting.

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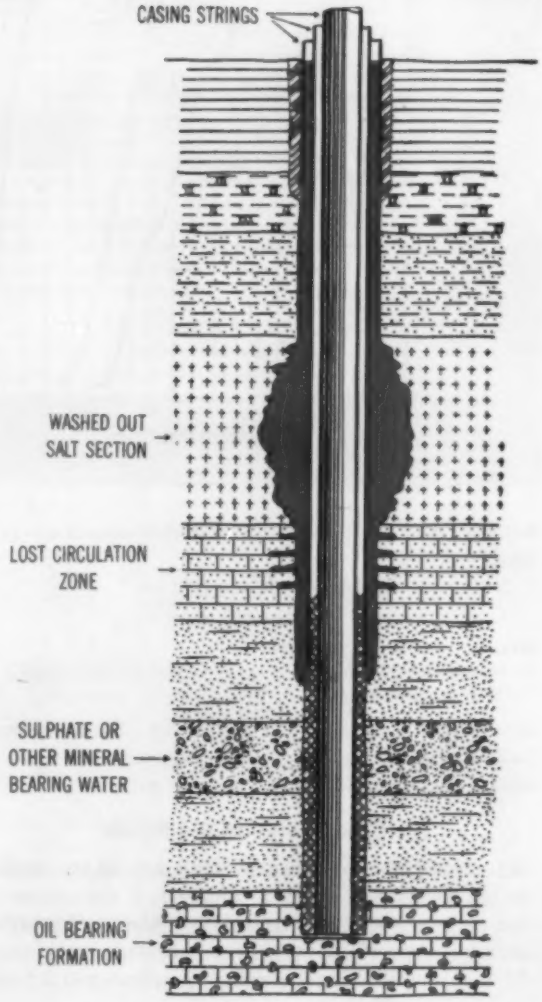

PROTECTION—under conditions typical of Permian Basin area.

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IOCC Wants Stiffer Imports Controls

- Group passes recommendation urging Government to adopt a firm plan to control both crude and product imports.
- Texas representative says Railroad Commission's order making pipeline connection compulsory will restore fair play to industry.

IMPORTS are hurting the conservation efforts of oil states as well as having a depressing effect on the domestic oil industry.

The Interstate Oil Compact Commission learned of these trends last week in a report from its special imports study committee. The compact, as a result, adopted a recommendation that the federal Government adopt a firm program limiting imports of both products and crude oil.

The action highlighted the compact's regular annual meeting in Kansas City, during which officials and representatives of oil states heard committee reports and general-session speakers deal with various aspects of oil conservation.

The imports question was presented in a committee report by W. A. Delaney, Ada, Okla., attorney and independent oil producer.

The Delaney committee report declared that excessive imports have undermined efforts of the oil states to prevent physical waste of oil and gas reserves. Delaney said depressed markets caused by imports have retarded progress on secondary-recovery operations, pressure-maintenance projects, use of casinghead gas, and use of various technological improvements.

He said the present voluntary program has reduced the rate of growth of crude imports but the jump in products coming into this country has more than offset this gain. The result is that total imports during 1958 have exceeded the 1957 rate.

Tariff proposed . . . Delaney reported conservation programs in the states will continue to be hampered unless stability is brought about in the rate of imports.

Foreign oil has assumed such a large portion of total supply that it is becoming increasingly difficult for state conservation agencies to anticipate the impact of imports upon domestic operations.

In addition, conditions created by excessive imports are reducing the availability of oil. He cited the case of Oklahoma where the deliverability factor has dropped from a top of 720,000 bbl. daily at time of the Suez crisis to 575,000 bbl. daily now. Delaney said similar declines are reported for most other states.

He concluded "it is my personal opinion that no voluntary plan may be relied upon. It is my personal thinking that a proper tariff would be the most effective control which could be established."

Demand outlook . . . The Delaney report was followed by a summary of the supply and demand outlook for 1959 given the compact by Minor S. Jameson, Jr., Washington, executive vice president of the Independent Petroleum Association of America.

Jameson said the government's import program for 1959 will be a major factor in determining the extent to which domestic oil production will increase over depressed 1958 levels.

If total imports do not exceed the 1957 level, he said, domestic oil production west of the Rockies would increase by more than 650,000 bbl. daily in 1959 over 1958.

New officers . . . Gov. Hugo Aronson of Montana was elected chairman of the compact for next year.

He succeeds Gov. Milward L. Simpson of Wyoming.

Other officers will be Z. Arthur Nevins, Kansas, first vice president succeeding Jack Jacobsen, Texas; Wilson M. Laird, North Dakota, second vice president succeeding James C. Hamill, Oklahoma. Earl Foster was reelected general counsel and Lawrence Alley, executive secretary.

Historic move . . . The compact also received an explanation of Texas' compulsory pipeline-connection order.

E. Bruce Street, independent oil operator of Graham, Tex., and a spokesman for a group of Texas independents, called the order a historic step in conservation and said it restores fair play to the industry.

Street declared the new order "may rank with gas flaring cases and other epic administrative decisions in the field of conservation law." He added that probably not in recent years has any order been subjected to more distortion and misrepresentation.

Street explained the order simply requires that common-carrier pipelines must connect lease batteries on application by the producer to the carrier. This is mandatory within a field when any common carrier is the only line serving the field. It is effective within the general area served by a common carrier which is an affiliate or subsidiary of a common purchaser.

Exceptions are provided when the pipeline can show inability to transport the particular quality of oil, inability to market the oil, or likelihood that the connection would not pay out in a reasonable time.

Real meaning . . . Street said the real benefits from the order probably are yet to be realized.

He reported significance of the order lies in the fact it sets up ground rules whereby a pipeline or producer can have his day in court. It is supported by the power of the Texas Railroad Commission to make room in the market for the unconnected oil by cutting back other production in the field and ordering ratable taking of the oil.

Street said real benefits will be realized when the commission finally puts its policy in practical form through a series of typical decisions.

He added that such cases have not yet been brought to the commission for final decision. Street claimed that pipelines have avoided test cases so far probably waiting for a favorable case.

In the meantime, the order has resulted in an encouraging number of new well connections in the state, he said.

Street asserted the real meaning of the move was to end discrimination in the connection of wells.

Often the producer's only recourse in the past was to make himself personally liked by the purchasing company in order to attract interest in his oil.

"Now the commission has set forth a procedure by which either side can obtain impartial determination of discrimination," Street said. "This is an order requiring ratable taking, which is the very heart of those conservation principles so essential to the survival of the small operator."

Other work . . . Compact committees during the 3-day session attacked a variety of conservation problems.

These projects included a completed model statute for states to use in starting or revising their oil conservation program, a suggested basic regulation of stratigraphic test holes, control of salt-water disposal, and a uniform back-pressure testing manual.

A special committee was created to make a study of the depletion allowance and its relationship to secondary-recovery and waste-prevention programs in the states.

Chairman of the committee is Thomas O. Miller, attorney general of Wyoming; Jake Jacobsen, Texas representative on the compact; James C. Hamill, Oklahoma; Jason W. Kellahin, New Mexico; and Clarence T. Smith, Illinois.

Compact General Counsel Foster in presenting a review of activities for the year declared the future of the compact is bright. He warned that 1959 will be a busy year for the commission and its member states. He added:

"Its principle is clear to all. No one is compelled to do anything. We have but one purpose—the prevention of physical waste of oil and gas from any cause. We have no legal duty, but our moral obligation is unbounded."

The compact will hold its midyear session next June 15-17 in New Orleans and its 1959 annual meeting December 3-5 in Philadelphia. The Alaska representative, Phil R. Holdsworth of Juneau, invited the compact to hold its 1962 spring session in his state.

Alaska Has the Rules

. . . needed for an orderly development of oil potential. Some question still remains concerning leasing policy.

ALASKA is ready to take its place among the nation's oil states.

When statehood is achieved officially, oil men doing business in Alaska will find a set of conservation, field, and land rules in effect more modern in many respects than those of old producing states.

This insight into future operations in Alaska was given the annual meeting of the Interstate Oil Compact Commission by Phil R. Holdsworth, Alaskan commissioner of mines.

Holdsworth told the oil regulatory officials this framework already has been established:

. . . A commission to administer the Alaska Oil and Gas Conservation Act, passed in 1955. The next meeting of the legislature is expected to provide necessary funds to staff an oil and gas section of the commission.

. . . Field rules and regulations which went into effect last October. Rules similar to those recommended by the oil compact have been established. These include 160-acre spacing for oil wells and 640-acre spacing for gas. Spacing rules, however, are subject to change by the commission following hearings and presentation of evidence to support a change.

. . . Standard report forms. The state commission already has adopted the oil compact's recommended uniform forms to accompany its regulations.

All this means, Holdsworth said, that oil men doing business in Alaska will be playing the game with familiar rules when statehood finally is achieved officially.

Land policies . . . Some minor confusion exists over the status of some lease applications which might be hanging fire when statehood is achieved.

Holdsworth explained that under statehood Alaska eventually will own about 30% of its land area.

Also under the Mental Health Act, Congress has granted one million acres to Alaska to support its mental-health program. This land, however, must be free of commitments. But under present federal regulations, if Alaska selects land on which application for oil and gas leases is pending, the application is automatically nullified.

Holdsworth said this "is a matter of some concern to the industry as the Bureau of Land Management has been so swamped with offers or applications that they have not been able to keep current in issuing leases."

P. R. Holdsworth
. . . competition for U. S. and Canada.

He added: "It is quite possible that offers or applications pending for several years may be nullified by an Alaskan section."

Besides about 103½ million acres that Alaska will be entitled to select under the statehood bill, the new state will have rights to its submerged lands.

This means, Holdsworth said, that the state would gain title to lands covered by inland navigable waters and lands extending seaward from the coastline for 3 geographical miles. This may become extremely important since most present petroleum exploration activities in Alaska are adjacent to tidelands.

In selecting its 103½ million acres, Alaska cannot pick any acreage which was leased after July 1, 1958. This boils down to 17 million acres in this category. Selections from this group of lands must be made within 5 years. The balance of the state's land sections may be made within a 25-year period.

New leasing policies . . . An Alaska Land Board already has been created to manage the state's new lands.

It is composed of the commissioners of agriculture, highways and public works, education, mines, and the attorney general. The board appoints its own director.

Leasing of the state lands for oil and gas activity will follow policies which have been in effect for several years under federal leasing laws. If land to be leased is on a known or producing geologic structure or one reasonably believed to contain such a structure, it will be offered only on a competitive bonus-bid basis.

If the land is considered noncompetitive, a lease may be issued under terms similar to those of the federal Government.

The land board will determine which lands controlled by the state will be competitive and which will not. The board has set public hearings in Anchorage for December 11 and 12 when a proposed policy will be presented by the board. Holdsworth said that comments and suggestions are solicited from interested parties at that time.

The outlook . . . Alaska has only a trickle of oil production now but has great possibilities (OGJ, Dec. 1, p. 75).

Holdsworth reported that of Alaska's land area of 375 million acres, nearly one-third has oil and gas possibilities. Of this, 40 million acres is under lease and exploration activities are picking up steadily.

Alaska still has not set up a policy on production controls. Since there presently is a difference of opinion on merits of market-demand proration for the state, officials have sidestepped this issue. It is expected to come up, however, at the next session of the legislature.

Holdsworth said any Alaskan oil found would compete with Canadian crude for markets among northwestern U. S. refiners and also may find a market in the Far East. He said the Orient is extremely interested in crude oil from Alaska. Japanese interests are currently considering actual participation in oil exploration in the new state.

Holdsworth pointed out that costs are a very important factor in determining any production rules in Alaska. He said an average deep well which would cost about $200,000 in other U. S. areas will cost about $1 million in Alaska. This means the production potential of an Alaskan well must be large and the well must be allowed to produce its potential in order to pay off.

At any rate, Holdsworth said, if Alaska's petroleum possibilities should come true, workable statutes, rules, and regulations are already in effect to let the oil industry operate orderly.

Plug for Fire Floods

. . . given compact meeting by Socony Mobil. Recovery of 50 to 80% of oil in place within 1½ years is predicted.

IN-SITU combustion recovery has progressed to the point where it is possible to predict that the method will recover a very high percentage of crude oil from a reservoir, will do it in a relatively short period, and will give an attractive economic payout.

These conclusions were presented to the IOCC by T. W. Nelson of Socony Mobil Oil Co. Nelson and J. S. McNeil, Jr., of Magnolia Petroleum Co. wrote a paper on thermal recovery.

The fire-flood method is particularly applicable to low-gravity oil fields, and Nelson said it would recover from 50 to 80% of the oil originally in place and do it within 1½ and 2 years.

Pointing out that some 180 billion barrels of crude oil is classified as unrecoverable by other means, Nelson said that in-situ combustion offers an economically attractive way of recovering much of this crude. Further development of the process may make it a significant factor in extending reserves and increasing production.

Using a hypothetical example, Nelson worked out an engineering program which would pay out in 5.8 years, yield a rate of return of 21%, and give a net profit per working-interest barrel after payment of federal income taxes of 61 cents per barrel of crude.

This example assumed a reservoir of 240 acres, 1,000 ft. deep, with 30 ft. of typical oil sand, and original oil in place of 1,500 bbl. per acre-foot.

Deeper reservoirs with lower oil content will not be as attractive economically, but Nelson said that it appears possible to go as low as 1,000 bbl. per acre-foot in oil content and several thousand feet in depth before the economics of the process become marginal.

On the basis of results made available from pilot projects in various places, Nelson said that in-situ combustion results in a combination of several types of drive. Here's how Nelson outlined the drives:

. . . A steam drive develops from heating the interstitial water ahead of the high-temperature burning front of the residual oil retained on the sand. This contributes substantial energy to the reservoir drive and the heat also decreases viscosity of the oil and enhances displacement.

. . . A gas drive also develops from the gaseous combustion products. These gases transfer heat to the oil, partially dissolve it, and partially displace it.

. . . The heat causes a mild cracking of the crude creating light hydrocarbons. This causes a hydrocarbon transition zone and thus a miscible drive.

. . . In addition there is the thermal drive as the heat energy is transferred to the oil by conduction through the sand and through the reservoir fluids.

Experience suggests that the best in-situ method may be a five-acre, five-spot pattern, though larger units may be practical.

Nelson suggested an arrangement of such patterns, each operating for about 600 days, and so scheduled that new ones would be started at a rate to keep the air compressors operating at maximum capacity throughout the life of the entire project. Otherwise, more air would be required at some times than at others, and much capacity would be idle.

In two field tests the volumetric sweep efficiency was 28 and 39%. This is the percentage of the total pattern volume that was burned, and is the key factor in determining the amount of air required in the process.

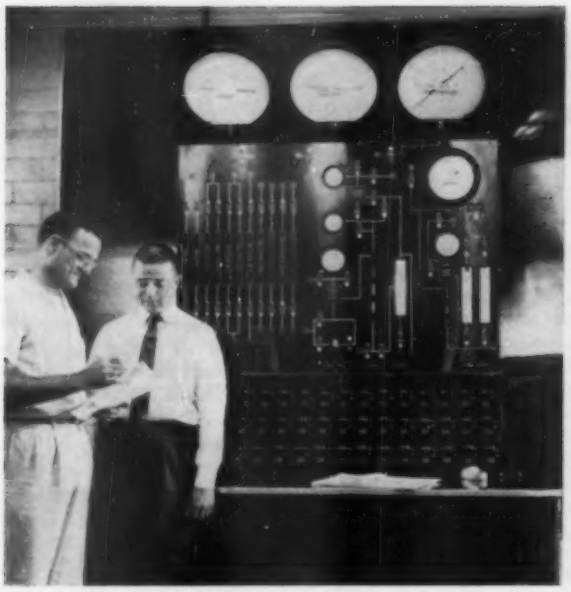
But unlike other recovery processes, much oil is recovered from areas of the reservoir not swept by combustion, which results in recoveries often much higher than 50%.

Key factors . . . The principal factors in designing an in-situ project are the amount of air required, rate of air injection, and air injection pressure.

Unit fuel consumption figures range from 240 to 280 bbl. per acre-foot, and the amount of air required is calculated at approximately 6.2 M.M. c.f. per acre-foot of total sand in the pattern. This might be doubled as a safety factor.

The burning front should advance at a rate of about one-quarter of one-half a foot per day once burning has become well advanced. Injection pressures used have ranged from 90 psig. for a 200-ft. deep reservoir to 300 psig. at 700 ft. depth.

Oil production starts to increase shortly after combustion starts and may reach 12 to 15 times the original production rate before combustion.



PANEL IS SECTIONALIZED with injection segment at the right and production section in the center. The schematic layout at left has valve locations numbered to coincide with numbered valve controls (three rows at bottom). Gages at top measure pressure on reservoir fluid and mixing cells, input pressure as fluid enters core, and pressure on produced fluids as they emerge from the core. Atlantic men in photo are Phil Braun, left, and Howard Koch.

PILOT RESERVOIRS and reservoir fluid and mixing cells are buried just outside the miscible-displacement section of the lab. Cannister-like objects protect cells, which protrude above the ground. These portions of the pilot plant were moved outside primarily to conserve space and enhance safety. The outside location permits using larger quantities of reservoir fluids and necessitates fewer mixes. Chuck Hutchinson, above, was codesigner of the control panel.

New Panel Speeds Reservoir Studies

• Atlantic eliminates many headaches in setting up water-flood or miscible phase experiments with new control panel. It virtually eliminates error, cuts lab time as much as 50%.

RESERVOIR experiments aren't the nerve-wracking headache they used to be in Atlantic Refining Co.'s Dallas production-research laboratory.

An ingenious control panel has eliminated much of the painstaking effort that used to go into the "setting up" of the experiments.

It used to be that for each new experiment technicians had to trace carefully the necessary flow tubing through a maze of similar lines connecting the pilot reservoirs, reservoir fluid-mixing and storage bombs, and other components of the pilot system.

There were many chances for error —in a field where it is highly important there be no errors.

Atlantic first used the panel to prove in the lab its pioneering high-pressure gas-injection process. This is the process, the first of the miscible-type drives, that is now performing so effectively in Block 31 field in West Texas and Neale field in Louisiana.

Further experiments led the company to apply the unique recovery idea to its Boyd lease in Slaughter field, where it is injecting propane, then gas, then water.

How the panel works . . . The panel is split generally into three sections:

. . . **An injection section,** where a technician can keep an eye on input pressure, volume, and fluid mix.

. . . **A production section,** which gives a constant check on fluid flow from the cores, which serve as reservoirs, and on core-outlet pressures.

This section also boasts a visual cell which enables an observer to actually see the number of phases flowing from the core. Actual reservoir temperature and pressure are maintained in this cell as well as the cores.

. . . **Flow control section,** made up of a telephone-jack type panel of numbered controls for all 48 valves in the pilot system plus a similarly-numbered schematic of the plant layout showing each valve location. A technician can quickly check the schematic to get the numbers of the valves which should be opened for an experiment, then open them.

High-pressure tubing and pipe connect the panel to reservoir fluid and mixing cylinders and the reservoirs—all of which are buried in the ground outside the lab.

The buried pilot-plant setup includes two cylinders containing separator gas under pressure, two more containing reservoir liquid, three mixing cylinders, and two "reservoirs." Cylinders containing natural gas and propane are inside the lab.

One of the two reservoirs is a 123-ft. sand-packed tube .8-in. in diameter. The other is a 20-ft. sandstone core 2 in. in diameter taken from an outcrop of the Boise sand in Idaho.

The reservoirs are enclosed in jackets which permit operation at reservoir temperature and at pressure up to 5,000 psi.

The fluid and mixing cylinders are connected to the panel with ⅛-in.

and ¼-in. high-pressure pipe, while ⅛-in. flexible tubing connects the panel with the reservoirs.

The separator gas and oil used to "charge" the pilot reservoirs for an experiment actually come from the same field wells.

A lab technician draws proper volumes of gas and oil from the fluid cylinders into the mixing cylinders by opening valves on the panel. A small compressor outside the plant moves the gas.

The fluids are cycled through the mixing cylinders under reservoir temperature and pressure until they reach an equilibrium. The mix is then displaced from the mixing cells and into the reservoir.

Displacement of the mix from the mixing cells both during the cycling and reservoir-charging operations is done with water by means of a pump. As well as displacing the mix, the water injection serves to maintain cylinder pressure so as to keep the mix in equilibrium.

Once the reservoir is charged in this way, Atlantic is ready to run another "unit displacement evaluation" using water, or high-pressure gas, or propane and gas, or propane, gas, and water, or other displacing fluids.

Live reservoir fluid produced from the core during one of these operations passes through two separator stages and both oil and gas are measured. The technician at the panel reads a liquid-level gage for the oil, a wet-test meter for the gas.

The entire operation, except for filling the separator gas and oil cylinders, is conducted from the control panel inside the lab.

Panel designers were Chuck Hutchinson, supervisor of the lab's reservoir-mechanics group, and Howard Koch, former leader of the miscible-displacement unit. Modifications have been made since by Phil Braun, current miscible-unit leader.

Fourth Island Test Drilling

RICHFIELD OIL CORP. has set surface pipe in its fourth stratigraphic test on Graham Island in the Queen Charlotte group off western Canada.

The completed strat holes were taken to 1,800 ft., 6,015 ft., and 4,700 ft. The five tests will cover the 75 by 50-mile island at intervals ranging from 15 to 30 miles apart.

Richfield is operator for itself and two partners, Consolidated Mic Mac Oils, Ltd., and Canadian Homestead Oils, Ltd. Together they hold 800,000 acres on the island. Richfield also has leases on about 900,000 acres offshore.

watching WASHINGTON

Joe Reilly

• The FPC's latest attitude on gas prices . . .

THE WELLHEAD price of natural gas continues to go up despite Government controls.

A report just issued by the Federal Power Commission shows that interstate pipeline companies paid an average of 12 cents per M.c.f. for gas they purchased from independent producers in 1957. A year earlier, the FPC reported, the average price was only 11.3 cents per M.c.f.

Reason for the price rise is the law of supply and demand, a law which the Supreme Court failed to abolish in placing independent producers under federal price controls.

The rising demand, as well as the rising price, is manifest in the FPC report. Purchases by interstate pipeline companies amounted to 6.5 trillion cubic feet in 1957 as compared to 6.1 trillion the preceding year.

Trend in recent years also is shown by an analysis of the sources of gas going into interstate pipelines. The report shows that prices are higher in the newer producing areas.

Texas, for instance, supplied 48.9% of the gas sold to interstate pipelines but accounted for barely 41% of the total revenue from such sales. Louisiana, where a larger share of the production comes from newly discovered fields, supplied 24.9% of the gas but accounted for 30.9% of the revenue.

THE AVERAGE price of gas is misleading. The going rate at which gas actually can be bought in some new producing areas is close to double the average price.

The current price is high because competition is so great. Paul Kayser, president of El Paso Natural Gas Co., made this point in recent testimony before the FPC.

Under questioning, Kayser agreed that competition from Transwestern Pipe Line Co. had been a factor in setting prices for new gas production in the Aneth, Utah, area. Transwestern reportedly was offering 20 cents per M.c.f. there before El Paso signed up most of the available gas at that price.

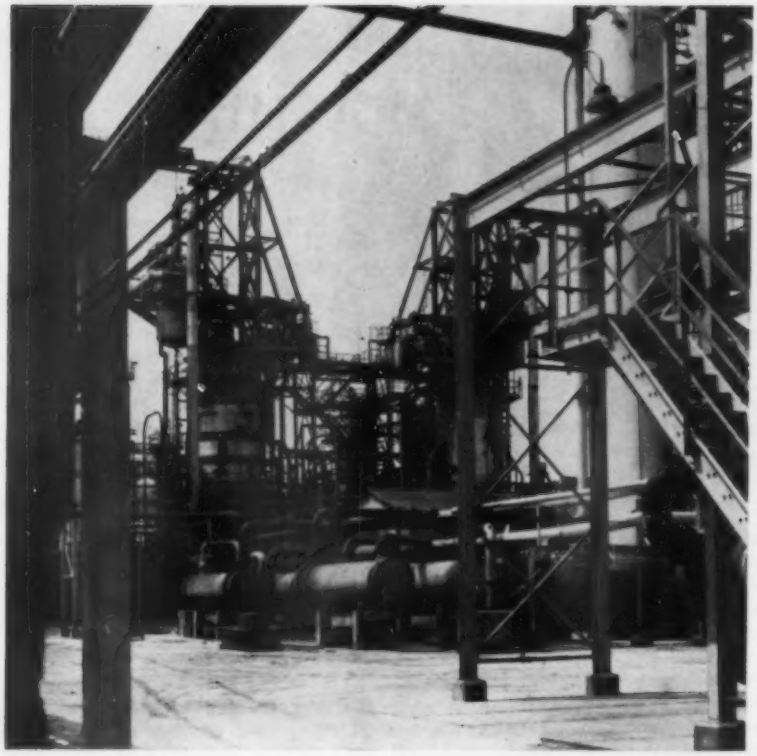
But Kayser pointed out that El Paso faced competition from the producers, too. Aneth producers "could build a pipeline over to California themselves," he said, "and they had that in mind." Producers, he found, were "entirely sophisticated as to the value of that gas and its relationship to the market."

ANETH OPERATORS have a pretty good idea what their gas is worth in a competitive market, but they don't know what the Government will decide it's worth. Some of them have, in effect, refused to sell their gas without FPC sanction of the contract price.

Those who recently accepted temporary certificates from the FPC were allowed to resume production from wells which had been shut in by the Interior Department to prevent waste of gas. Once their gas started flowing into the pipeline, their reserves were committed to El Paso Natural. The price eventually to be received for the gas is still subject to FPC approval.

The FPC is not altogether enthusiastic about its new responsibility over producers. But Commissioner William R. Connole dissented recently when fellow commissioners authorized the sale of gas from Mississippi's Dexter field without deciding the "crucial issue" concerning prices.

The FPC's policy of authorizing a sale and leaving the price to be decided later is now before the Supreme Court. The ruling may have far-reaching effects in determining how much gas will be available at prices set by the Government.



NEW LIFE will be breathed into abandoned Brownsville equipment.

Unique Plant to Be Converted

. . . to petrochemical use by Union Carbide. Final curtain goes down on Amoco's costly synthetic-fuels project.

THE ILL-FATED and costly synthetic-fuels plant at Brownsville, Tex., will be resurrected—but this time not to make gasoline from air and natural gas.

Union Carbide Corp. has exercised its option to purchase the defunct facilities as a nucleus for the company's third petrochemical plant in Texas.

The transaction with Amoco Chemicals Corp. includes usable facilities on the 306-acre tract, plus the 42-mile Weslaco-Brownsville natural-gas pipeline.

Morse G. Dial, Carbide board chairman, said the company doesn't intend to synthesize gasoline or other oil products, nor to produce chemicals by the Fischer-Tropsch process. Its petrochem project will depend on completion of arrangements for fuel gas and raw materials.

The plant is well located from both the supply and marketing standpoints. Natural gas is available by 16-in. pipeline, and the plant and storage terminal are on deep water. Products could be shipped up the Eastern Seaboard by tankers and by barge up the Mississippi and Ohio rivers.

Disappointment . . . The gas-synthesis plant, which cost about $100,000,000, was one of oil's most interesting but expensive near misses.

Amoco shut down operations more than a year ago, describing it as "a technical success but an economic disappointment" (OGJ, Sept. 23, 1957, p. 84).

The plant extracted oxygen from air and mixed it with natural gas in a generator under high temperatures and pressures to get a partial oxidation. Charge stock thus produced passed through a fluidized iron catalyst bed in the reactors to produce the equivalent of light crude, plus water and oxygenated compounds in water solution.

The project began in 1945 when nine firms joined to form Carthage Hydrocol, Inc. The plant went on stream in 1950. Meanwhile, Stanolind Oil & Gas Co. (now Pan American) built a $15-million chemical plant to use raw chemicals to be produced. Storage and shipping terminal was built by U. S. Industrial Chemicals Co.

Carthage was plagued by shutdowns, and in 1954 Stanolind took over, consolidating holdings under Hidalgo Chemical Co., later Amoco Chemicals.

The new owner, Carbide, has two other Texas plants. The Texas City operation started in 1941, and in 1954 a plant at Seadrift was put on stream. Both plants have grown and are multimillion-dollar operations feeding off natural gas and light hydrocarbons, producing a wide range of petrochemicals.

Gas Firm Appeals

to high court in challenging FPC price-fixing authority.

THE U. S. Supreme Court will decide whether the Federal Power Commission is limited to the "prevailing price" in fixing prices for natural gas.

At issue is a 13.9-cent per M.c.f. rate granted producers of gas bought by Natural Gas Pipeline Co. of America.

Oklahoma Natural Gas Co. and others challenged the rate on the ground that it was higher than the going price in Jack and Wise counties, North Texas. Oklahoma Natural does not purchase gas in the same area nor buy from Natural but argued that the rate has a direct effect on gas it takes just across the border in Oklahoma.

The District of Columbia Appeals Court rejected the claim and upheld the FPC. The case comes to the higher court on appeal by Oklahoma Natural.

What's involved . . . The suit involves gas in Jack and Wise counties where reserves are estimated at 2½ trillion cubic feet and are among the largest discovered in the United States in recent years.

The going price in this area at the time of the FPC decision was 10 cents per M.c.f. An FPC examiner recommended that the rate to Natural be fixed at 11 cents, but the full commission permitted the higher rate to go into effect.

The North Texas gas purchased by Natural moves through its new pipeline extension across southern Oklahoma to its main system near Fritch, Tex. Oklahoma Natural charged that the line was designed to pass through southern Oklahoma where it buys about 60% of its gas.

The prevailing price in southern Oklahoma has risen 1 cent per M.c.f. since the FPC acted, the court was told.

Oklahoma's case is being supported

by the National Institute of Municipal Law Officers. This group, representing the public, contends that the issue "vitally affects every municipality in the United States which purchases natural gas for its own consumption, or whose residents are consumers of natural gas."

CATC Wildcat Hits

off Louisiana. Multiple gas pay logged at Ship Shoal.

THE CATC Group has a new offshore gas and oil discovery so good that it abandoned its usual custom of waiting for tests before announcing the find.

Based on loggings, the well apparently has found a rich multiple gas reservoir in the eastern portion of Block 199 in the Ship Shoal area off Terrebonne Parish, Louisiana.

The well is the A-1 Ship Shoal Block 199, 40 miles offshore. It's now drilling below 11,000 ft. toward a 14,000-ft. objective. Water depth is about 77 ft.

Loggings between 5,000 and 10,000 ft. show multiple gas pays and one probable oil pay. Just how good they are won't be known until tests are made after total depth is reached.

The well, first in Block 199, was spudded October 25 by Rowan Drilling Co., contractor for Continental Oil Co., the operator.

CATC has two blocks of 5,000 acres each in the discovery area. The nearest production is 1½ miles north, where Gulf Oil Corp. found gas pay at about 6,800 ft.

Felmont Expands in Texas

NEW PROPERTY acquired by Felmont Petroleum Corp., Midland, will hike the company's current oil production in the U. S. and Canada by about 37%.

Felmont bought 3,490 acres of Panhandle field leases in Hutchinson County, Texas, from Brown & Thorp Oil Co., McCamey, Tex., and King Oil Co., Inc., Wichita Falls.

The leases have 134 wells producing about 1,100 net barrels of oil and 4,000 M.c.f. of gas daily. Also involved are 50 proved locations.

Felmont recently bought interests in 1,280 acres of proved and semi-proved leases in the TXL area of Ector County from G. M. Graham and G. D. Putnam, Midland. This included three producing oil wells in the Tubb zone of the lower Clear Fork formation. Two more are drilling.

Service Station on Wheels

. . . makes world debut in Oklahoma City shopping center. Petrofina testing system featuring "gas while you shop."

AMERICAN PETROFINA is taking a fling at chasing potential customers with its gasoline rather than waiting for them to come after it.

Last week, startled shoppers in Warr Acres, a suburb of Oklahoma City, watched the first test of this completely unconventional approach to retail gasoline marketing.

Buzzing around Warr Acres' Westgate shopping center and filling auto gas tanks while mama shopped, was a compact, canopied vehicle.

It also dispenses motor oil and air —offers, in fact, the same services as a regular station except for complete car lubrication and washing.

The all-steel mobile unit measures 10½ by 6 ft. and weighs 3,500 lb. when full of gasoline and 1,100 lb. when empty. It packs two regulation gasoline pumps with a total capacity of 300 gal. of American Petrofina's Fina premium and regular motor fuels.

Both vehicle and pumps are powered by a 2½-hp. motor operating off a 36-volt direct-current battery.

The tank on the front bumper of the vehicle is a 500-lb. air-compressor tank for use in inflating tires. A "lazy susan" type rack next to the driver's seat holds 48 cans of motor oils.

Exclusive lease taken . . . The mobile station was invented and patented by Joe S. Cline, Oklahoma City. American Petrofina has an exclusive lease from Cline throughout the company's 13-state market area in the Mid-Continent and Southwest.

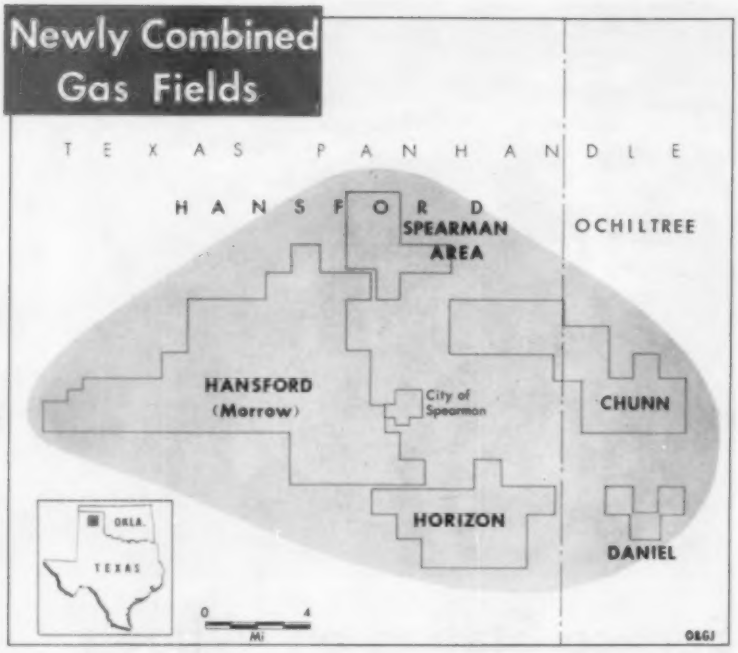
It has officially dubbed its unique marketing experiment "Fina a la carte." The scheme will undergo an extensive test run at the Warr Acres location. If successful, American Petrofina plans to "expand into other shopping areas as rapidly as the units can be built."

J. M. Shea, Jr., Fina's vice president in charge of marketing, told the Journal the station on wheels "is a time saver and convenience to housewives or other shoppers who would like to have their automobiles serviced while grocery shopping or performing any other errands."

All working parts of the unit, he said, bear the Underwriters Label. The unit itself has been approved by the safety engineer of Warr Acres.

American Petrofina is the nation's newest integrated oil company, a subsidiary of the big Belgian oil firm. It began operations about 2 years ago with a merger with Panhandle Oil Corp. Later, it acquired the complete holdings of American Liberty Oil Co., Dallas. Most recent expansion was its purchase of all holdings of Petro-Atlas Corp. of Tulsa and a wholly owned subsidiary, El Dorado Refining Co., El Dorado, Kans.

The company now operates 1,500 service stations in its 13-state area.



Nine Panhandle Fields Merged

. . . into one producing area with three reservoirs. Ruling by Texas commission may bring a rash of dual completions.

THE SPRAWLING Morrow sand gas-producing area in Hansford and Ochiltree counties in the Texas Panhandle will take on a new look January 1.

The Texas Railroad Commission, after nearly 9 months of hearings and study, has moved to consolidate nine fields into three new ones.

These field names will be eliminated: Chunn (Morrow), Daniel (Upper Morrow), Daniel (Lower Morrow), Hansford (Morrow), Horizon (Morrow), Horizon (Keyes), Spearman (Upper Morrow), Spearman (Morrow), and Spearman (Basal Morrow).

Replacing them will be the Hansford Upper Morrow, Hansford Middle Morrow, and Hansford Lower Morrow.

The commission defines the Morrow as that section between the base of Thirteen Finger lime and the top of the Mississippian.

The Upper Morrow is the zone lying between 7,170 and 7,488 ft. in Humble Oil & Refining Co. 1 Rosson in Section 96, Block 4-T, T&NO Survey in Hansford County.

The Middle Morrow is the zone between 7,500 and 7,610 ft., and the Lower Morrow is the zone between 7,620 ft. and the top of the Mississippian in the same well.

Three other Morrow fields in the general area will remain separate fields. These are North Hansford, East Spearman, and South Bernstein.

Dual completions . . . Past well-completion practice in the area has been to open the entire Morrow section of about 600 ft. to production.

All zones have been considered as one for proration purposes. Consequently, the commission's new order separating the zones likely will mean a flood of dual-completion applications between now and January 1.

This likelihood is strengthened by a commission threat to remove from the proration schedule any well in which the newly designated zones are not separated by January 1.

Field rules set . . . Operators must file certified unit plats, acreage affidavits, and commission forms PF and GWT-2 by December 9. New forms SW-1 must carry the proper new field designation for each well.

Rules for the three new Hansford nonassociated gas reservoirs include:

. . . 1,250-2,500-ft. spacing for wells in the same reservoir.

. . . 640-acre proration units with 100% tolerance for each unit and acreage limited to that within 6,000 ft. of the well.

. . . Allocation based on acreage times bottom-hole pressure, with provision for filing bottom-hole pressure reports.

. . . Fresh-water protection to the base of the Permian Red Beds at about 500 ft.

. . . Production casing set through the producing formation and cemented to 600 ft. above the top of the uppermost oil or gas formation penetrated by the well.

Biggest Flood Unit

near reality as operators agree on investment issue.

WHAT MAY BECOME the world's largest unitized water flood has hurdled its biggest obstacle.

Operators in Spraberry Trend Area field of West Texas have finally threshed out a basis for adjusting investments for the 64,000-acre flood proposed by Sohio Petroleum Co. in the Driver area.

The knotty investment question had stalled negotiations for almost 9 months. Unit participation, the issue normally hardest to settle, had long since been fixed (OGJ, May 5, p. 63).

The entire unit agreement now will be framed and circulated within the next 2 or 3 months for approval of working and royalty interest. Approval of working interests is considered in the bag. Final step will be approval by the Texas Railroad Commission.

Other large units are planned in adjoining areas.

Operators have been marking time waiting for the Sohio unit to take final form and set patterns and precedents on such things as participation and investment-adjusting issues.

Other units are planned by Humble, Magnolia, Phillips, Tidewater, and Cities Service.

Arkansas Has New Field

A DEEP gas-condensate field is being opened in southwestern Arkansas as one of the state's best discoveries this year.

Its discovery well, drilled by Coulston Drilling Co. of Gladewater, Tex., is completed in the Smackover-Ford zone with a calculated open flow rate of 48,000,000 cu. ft. of gas per day. Gas yields 25 bbl. of 65°-gravity condensate per 1,000,000 cu. ft. Completion is in a casing-perforated interval at 8,130½-38½ ft. in hole drilled to 8,271 ft.

The new field, tentatively named East Kress City, is 2½ miles south of Stamps, in Lafayette County.

Asphalt Runways Not Favored

. . . by military in report to House committee. Army sides with Air Force by endorsing concrete airfield paving.

A NEW ROUND flared last week in the running battle between asphalt and concrete for airfield runways, with military officers moving over to support of concrete.

Army Corps of Engineers edged over to the Air Force preference for the rigid paving as Maj. Gen. Walter K. Wilson, Jr., deputy chief of engineers for construction, reported to the House armed services subcommittee on tests at the Columbus, Miss., Air Force base.

The general said it is "possible" to construct a runway of either asphalt or concrete that will "provide adequate service for normal B-52 operations."

But, he said, "operational conditions may occur that could cause objectionable roughness in flexible pavement because of differential settlement. Therefore, as a general policy," he said, "we are in agreement with the Air Force that a center strip of rigid pavement in runway interiors is good insurance."

Up to now, both asphalt and concrete have been called suitable for the center strip, about 75 ft. wide, of the interior runways.

The interior runway is all but the 1,000 ft. on each end, which have been handed over to concrete on the grounds blast and heat in these areas would damage asphalt.

Air Force view . . . John Ferry, deputy chief for installations of the Air Force, went further than Wilson in endorsing concrete.

"It is the Air Force position," he said, "that the portland cement runway is preferable, but that when substantial economy is possible, it is proper to use a portland cement center and flexible sideways."

The sideways on a 300-ft. runway would be about 112 ft. wide on each side. They would run the length of the runway, except for the 1,000-ft. strips at each end. Some runways go up to 13,000 ft. long.

Two flying generals from the Strategic Air Command provided more ammunition for the concrete side. They testified pilots have more "confidence" when flying on rigid pavements. They complain of a "porpoise" surface with asphalt.

Navy view . . . Rear Adm. E. J. Peltier, chief of the Bureau of Yards and Docks of the Navy Department, preferred concrete when the air pressure in the tires of Navy airships is more than 250 lb.

The pressure at times runs up to 400 lb. With pressures below 250 lb., he said, the Navy finds asphalt paving suitable.

The Navy has no weight problem comparable to that of the Air Force, he said.

The average Navy airship is 27,000 lb., and Navy fields are designed for a maximum weight ship of 100,000 lb. In contrast, it was explained, the B-52 bomber weighs 500,000 lb.

Asphalt defended . . . The Asphalt Institute defended asphalt as the cheapest, simplest, and quickest material to use for runways, and cited facts and figures indicating asphalt can be used safely for runways.

Officials of the institute complained that the Air Force preference for concrete has prevailed in taxiway areas and the ends of runways, and now is being extended to the center strip of runways.

The institute objected that the Air Force frequently does not give asphalt a chance to bid on Air Force construction.

Octanes Move Up

slightly in November. West Coast leading in premium.

AVERAGE QUALITY of both premium and regular gasoline increased another 0.1 of a research octane in November, boosting premium to 98.8 RON and regular to 91.5.

It was the third successive monthly increase of that amount for premium. Average premium was 0.4 of an octane above a year ago and regular 0.5 of an octane.

Once again it was the Far West that led in premium. Five of the six West Coast cities included in Ethyl Corp.'s monthly survey showed up with premium averages of 99 RON or more. So did Phoenix. Bakersfield, at 98.9, was the only one under that figure.

Usually sharp increases were registered in Portland, Ore., up 0.6 from October, and in San Francisco and Seattle, both up 0.4. San Francisco, with a premium average of 99.5, led the entire country. Seattle, with four 100-octane or better brands on sale, had more brands than any other city in this category.

While premium quality has been going up rapidly on the West Coast, regular quality has lagged a bit. Premium increases from a year ago range from Portland's 1.4 to San Francisco's and Seattle's 2.0. Except for Spokane, where both premium and regular are 1.6 above last year, the regular gains have not been as great.

The West Coast is leading all other sections of the country in premium quality, but the northeastern area, where 99.3 regular is common, is tops in pool quality. Regular in the Northeast is 4.0 to 6.0 RON above the West Coast figures.

In 24 of the 57 cities covered in the survey premium averaged 99 RON or better. The survey also checked 41 samples of superpremium or third-grade brands in 21 cities. One of these samples tested 102.9.

UOP Sale Near

Hearing next week will fix terms, select underwriters.

LAST PROBLEMS holding up the sale of Universal Oil Products Co. should be solved within a week.

Louis M. Loeb, court-appointed referee, will hold a public hearing December 15 in the Bar Association offices in New York to consider selection of underwriters, terms of the sale and of the underwriting agreement, and provisions of an employe stock-incentive plan.

Sale of UOP was approved November 28 by Jacob Markowitz, New York Supreme Court justice.

It is commonly reported on the street that Lehman Brothers will handle the transaction.

Terms will include the provision that no minimum price will be fixed for the securities and that no more than 2% can be sold to a single investor except institutional investors such as investment trusts, life insurance companies and pension funds.

First Boston Corp., court-appointed expert, recommended distribution through a nation-wide group of underwriters to insure wide distribution and to prevent a single investor from gaining control.

Still undetermined is the amount Guaranty Trust Co., which has acted as trustee, will receive as a fee. Guaranty has asked for 10% of the proceeds of the sale, expected to approximate $50,000,000.

The New York attorney general's office, the supreme court, and the referee have contended that Guaranty's request is excessive. The fee will be determined after the sale.

Discovery of Oil Shocks Operators Looking for Gas

IN AN IRONIC twist, the discovery of oil in an Alberta field has left its discoverers in a quandry.

Oil was just about the last thing in the world they wanted to find.

The field is what has been called Carbon gas field. The oil finder is Western Leaseholds, Ltd. And on the spot as a result of the development is Canadian Western Natural Gas Co., which supplies Calgary and most of the rest of southern Alberta with natural gas.

Here is the problem:

The field, 60 miles east of Calgary, has been established as a gas field. It was thought a handy source of supply for Canadian Western during peak-period consumption.

Canadian Western built a $2,820,000 pipeline from Carbon to carry the gas to its Calgary distribution system. That line is now complete, except for some gathering facilities.

But then Western Leaseholds, in testing its Calvan et al. Carbon 11-9 well, discovered oil.

Recovery ranged from 1½ to 5 bbl. an hour, with a gas potential of 576,000 cu. ft. daily.

The hitch . . . A basic principle of Alberta's Oil and Gas Conservation Act is that if sufficient oil is found in a field to warrant commercial production, the gas must be returned to the ground to maintain pressure.

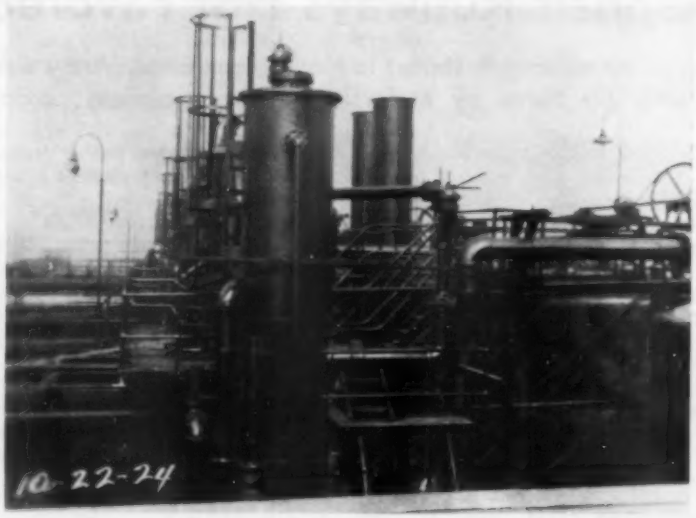
Leduc field is one example where gas wells had to be capped to assure oil production.

Although several dry holes have been drilled in Carbon field, Western Leaseholds' surprising well was the first oil discovery. There has, however, been speculation regarding oil deposits in the field.

Normally after an oil discovery, operators would schedule more wells immediately to determine the oil potential, but no such drilling plans have yet been announced for Carbon field.

It is likely the Alberta Gas and Oil Conservation Board will be left with the problem of deciding whether gas can be taken from the field. It is also likely that the decision will rest mainly on the question: What constitutes oil production of commercial quantity?

While only $2,820,000 is being spent on the Carbon-Calgary pipeline, the entire program involved in development of the field, gathering facilities, and other work would bring the total to about $10,000,000.



Cat cracking once was accidental

CAT CRACKING is the workhorse of the refining industry today. Everybody does it. But back in the early days of refining, some operators were accidentally cat cracking stocks without realizing what they were doing.

This is one of the many interesting facts turned up by our processing editors as they pored over the archives to gather information for Petroleum Panorama, which will be published by the Journal next year to commemorate oil's 100th anniversary.

Fuller's earth or other surface-active clayey materials have been used for many years to remove impurities from petroleum products and to improve their color. Often in the early days the streams had to be heated before clay treatment. And since all firing was done by hand, it was not unknown for a stillman to let the temperature go higher than called for.

Result of contacting the overheated stock with clay was the formation of appreciable quantities of light ends. This puzzled the old-timers, because they knew that while the temperatures were higher than usual, they were well below thermal-cracking levels.

It was not much later that the old-time operators were able to look back and explain what had happened.

However, these "accidents" did not prove to be the foundation on which the catalytic-cracking processes were built. Dr. Robert E. Wilson, testifying in the government's cracking case, U. S. vs. Standard Oil Co. (Ind.), 1926, said:

"I do not include in that catalytic process class certain processes which claim more or less catalytic action. There are a good many of the prior art that put iron filings or fuller's earth, or any one of a dozen things into their reaction chamber or tube, and claim that they improve the results. But, as a matter of fact, most of those are substantially or entirely inactive."

THE FIRST COMMERCIAL catalytic-cracking process, specifically designed to make gasoline from heavier material, is generally conceded to be the McAfee Alchlor process.

The first unit was built by Gulf Oil Corp. in 1919 from a patent developed by Dr. A. M. McAfee. The accompanying picture shows some units constructed in 1924.

The history of catalytic cracking is developed in Petroleum Panorama, as is the evolution of every major process used in refining.

Petroleum Panorama traces refining from the 5-bbl. Kier still to the latest highly automated giants turning out today's highly refined products.

It outlines the history of the industry from the kerosine age to the jet age. We think you'll find it accurate, interesting, and informative, but not too detailed, when you receive your copy in January.

—The editors

Texas City Refining Inc. cuts valve replacement cost 500% plus

"Craneloy 20" valves on sulphuric service outlast valves formerly used 6 to 1

Handling sulphuric acid in varying concentrations is tough service for any valve.

At this Texas City, Texas, refinery, valves used on lines from sour water strippers never lasted more than 6 months. It was a case of "install today . . . replace tomorrow."

Three years ago, "Craneloy 20" gates were selected for this service. These high-nickel, high-chromium stainless valves, with rotating split-wedge disc seating, have given trouble-free service ever since. No leakage, no galling or seizing; and always operating smoothly.

To date, "Craneloy 20" valves have outlasted the other make valves 6 to 1—better than a 500% saving in replacement and maintenance cost.

If you're having trouble with valves on sulphuric acid or similar corrosive fluids, your Crane Representative has all the information on the "Craneloy 20" line.

Bring yourself up to date on corrosion-resistant alloy valves. Send for this Crane Circular AD-2080 today.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

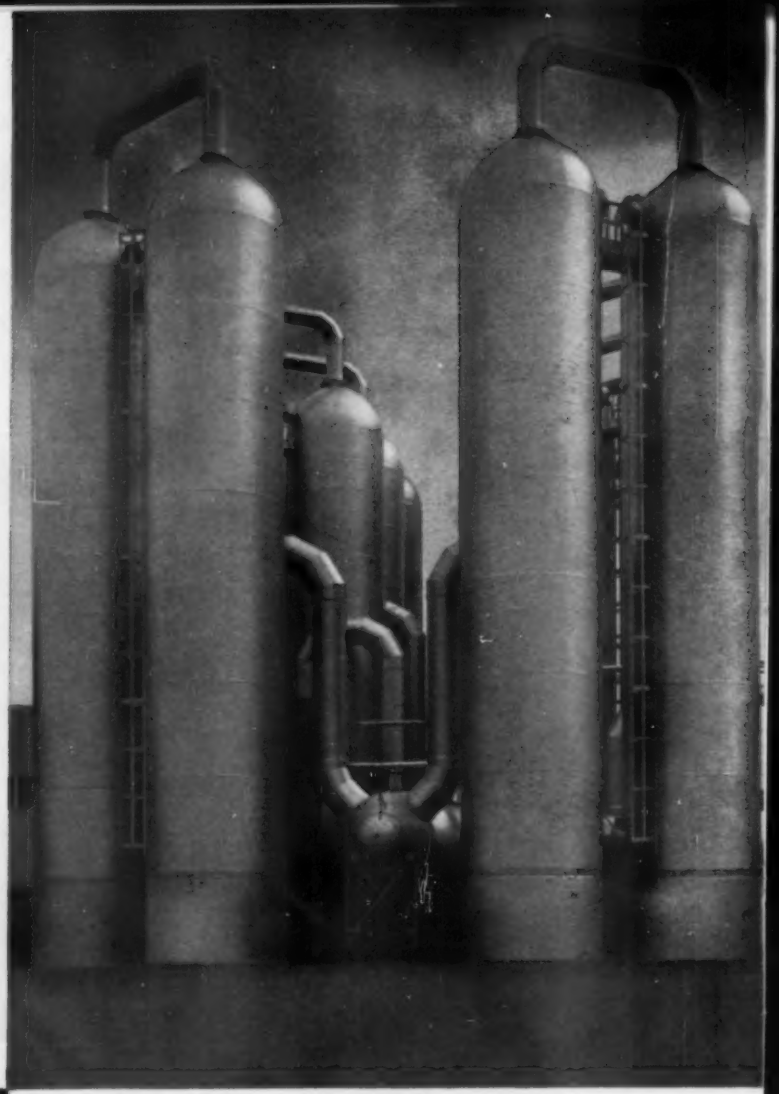
Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

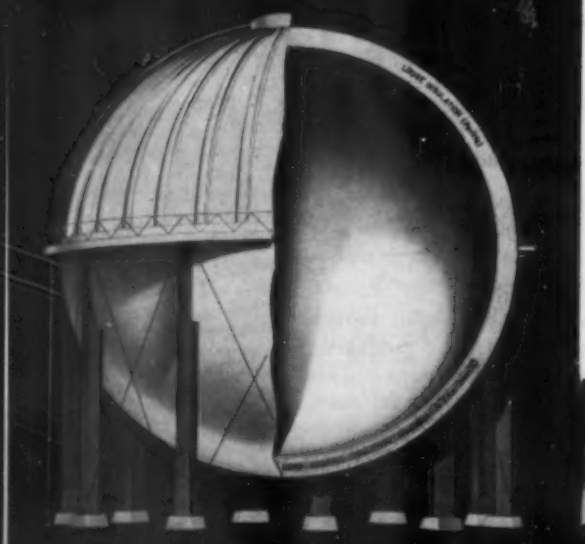
12 Vertical Pressure Vessels of T-1 Steel,
Each 63' x 11', Storing Air at 600 psia

PDM

ENGINEERS · FABRICATORS · CONTRACTORS

Double Insulated Spheres for
Low Temperature Storage

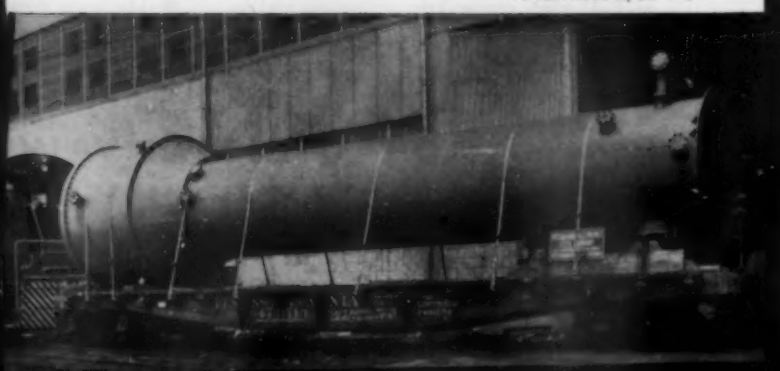




Cutaway View, Insulated Storage Sphere
for Liquefied Chlorine — 30 F.

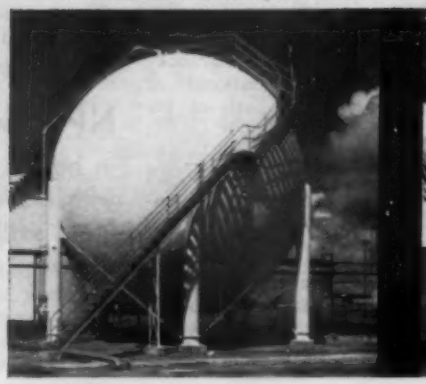
TANKS, PRESSURE VESSELS
PLATE CONSTRUCTION
STRUCTURAL STEEL
...for the Refining Industry

Vertical Reactor, 55' x 8'



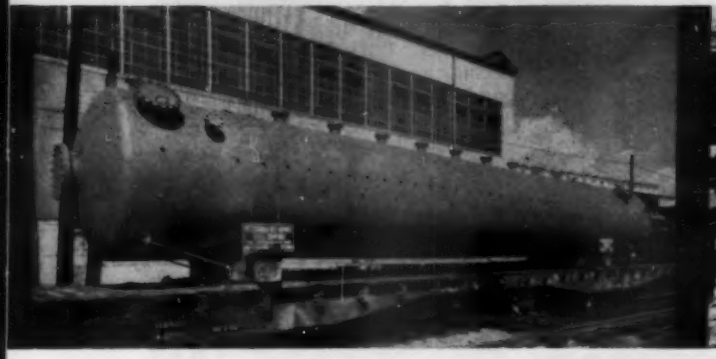
Elevated Water Storage for Compressor Stations

5000-Barrel Pressure Sphere



Flat Bottom Cone Roof Storage Tanks

Absorber Tower, 57' 9" x 8' 6".



5600 Tons of Radial Cone Bottom Mud Washers and Thickeners, Each 100' in Diameter.

Pittsburgh-Des Moines Steel Company

PRODUCTS—Tanks, A.P.I. • Tanks, floating roof • Tanks, special • Tanks, insulated • Tanks, lined • Elevated tanks • Pressure vessels • Spheres • Plate construction • Large diameter piping • Structural steel • Industrial type buildings • Steel bridges

MATERIALS—Pittsburgh-Des Moines builds tanks, vessels and structures of steel, stainless steel, stainless clad steel, alloys and aluminum

SERVICES—Pittsburgh-Des Moines' complete service to the client includes *design*, to accomplish required objectives—*selection of material*, proper for service needs—*preparation of detailed drawings*—*fabrication*—and *delivery* and *erection* or *installation*. Included also are the design, procurement and installation of all associated items such as foundations, pumps, compressors, coolers, dryers, piping, insulation, refrigeration, controls, electric wiring, etc.

SCOPE—The range of PDM product manufacture includes tanks, vessels and plate construction of plates from ⅛" to 13" thick, shop-built vessels and structures, weighing up to 100 tons, and field-assembled vessels or structures of any size.

ENGINEERING—The development, design and coordination required for successful completion of the widely varied work of the Company are functions of our Engineering and Research facilities. Our engineering groups comprise men outstanding in creative engineering, structural design, stress analysis, metallurgy, welding techniques, physics, gas dynamics, heat exchange, mechanical, electrical and control work.

RESEARCH—PDM Research investigates problems encountered in engineering for which known data or criteria are not available. A large part of our research is devoted to product improvement and the solution of new problems created by unusual and advanced projects undertaken. Materials and conditions for storing various chemical substances, protective coatings for structures and vessels, heat exchange rates and insulation values, etc., are tested and evaluated. From these studies and much related work has come a wealth of data advancing our ablity to serve our customers with better structures at the lowest levels of cost.

INQUIRIES—We invite your inquiries and the opportunity to quote on steel tanks, platework and structural steel fabrication of every type, including design studies, research, engineering, and erection. Consultations will gladly be arranged at your convenience, without obligation of any kind. Write, telephone or wire our nearest office.

Pittsburgh-Des Moines Steel Company

Plants at PITTSBURGH, BALTIMORE, DES MOINES, SANTA CLARA, FRESNO, and STOCKTON, CALIF.

Sales Offices at:

PITTSBURGH (25).....3496 Neville Island
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CHICAGO (3)..602 First National Bank Bldg.
EL MONTE, CAL.....P. O. Box 2012
ATLANTA (5)....361 E. Paces Ferry Rd., N.E.
DES MOINES (8)..... ..997 Tuttle Street
DALLAS (1).....1201 Praetorian Bldg.
SEATTLE (1).....Suite 306, 500 Wall St.
SANTA CLARA, CAL.....603 Alviso Road
DENVER (2).....323 Railway Exchange Bldg.

Sales Policies Hit

. . . in antitrust suit. Government accuses three Standard companies of illegal purchasing and sales agreements.

THE JUSTICE Department has accused Jersey Standard and Esso Standard of making an agreement with Kentucky Standard to divide their marketing activities.

Government lawyers have filed a civil suit to void the agreement.

Justice Department spokesmen say the agreement provides that Kentucky Standard handle marketing in Kentucky, Mississippi, Georgia, Alabama, and Florida and that Jersey Standard and its subsidiaries are to keep out of these states.

Part of the agreement, it is alleged, is that Kentucky Standard is not to expand into other areas.

The Government also alleges that Kentucky Standard agreed to buy its petroleum products from Jersey Standard or its affiliates, when they are able to furnish them at a mutually agreed price.

The accusations are contained in a civil antitrust suit filed in the U. S. District Court at Louisville, Ky. The Government calls the alleged division of markets a violation of the Sherman Antitrust Act. The alleged supply agreement violates both the Sherman Act and the Clayton Antitrust Act.

In a statement, Esso emphatically denied any wrongdoing under the antitrust laws. It has been selling to Kentucky Standard for more than 40 years, it said, "under perfectly proper business agreements."

Esso also denied any arrangements have been made between the companies to set aside the states where each would market.

The agreement . . . The complaint maintains that since July 1956 Esso and Kentucky Standard have been operating under a contract requiring the Kentucky firm to buy 80% of its requirements of automotive gasoline, kerosine, diesel fuel oil, and No. 2 heating oil from Esso.

The contract is called one in "unreasonable restraint of trade" and thus violates the Sherman Act.

Sales under the contract are labeled as "substantially lessening competition" and thus a violation of the Clayton Act.

The complaint says Kentucky Standard "is engaged in marketing refined petroleum products and has purchased about 98% of its requirements from Esso and its predecessors from 1911 to 1948, and 76% of its requirements from Esso since 1948."

The Government called Kentucky Standard "the principal marketer" of automotive gasoline in each of the states in which it markets.

The firm handled 925 million gallons of gasoline in 1956, which represented 17.4 per cent of all tax-paid sales of gasoline in Florida and 23.3 per cent in Kentucky.

The result . . . Government claims effects of the conduct have been:

. . . **To prevent competition** between Esso and other refiners for the business of Kentucky Standard.

. . . **To prevent Kentucky Standard** from expanding into other states and Esso and other Jersey affiliates from marketing in the five states.

. . . **To restrain trade** and substantially lessen competiton in petroleum products.

Relief asked by the Government includes a ban on sales by Esso and Jersey to Kentucky Standard "during such period of time as the court may deem necessary."

The DJ also asked that:

. . . **The division of markets** and the operations of the supply contract be judged unlawful and that the companies be stopped from carrying them out.

. . . **Jersey and Esso** be perpetually enjoined from "discriminating in their regular course of business against anyone wanting to buy products upon reasonable terms and conditions.

Esso markets gasoline and other products in 18 states and in the District of Columbia. In 11 of these areas it is the principal marketer.

Big Pipeline Project to Start

NORTH CAROLINA Natural Gas Corp. will start construction on its 630-mile, 2 to 16-in. transmission system this month.

Contracts have been let to J. P. Neill & Co., Inc., Dallas, 112 miles of 16-in.; Somerville Construction Co., Ada, Mich., 386 miles of 2 to 12-in.; and C. N. Flagg & Co., Meriden, Conn., 102 miles of 3 to 6-in.

Construction will be completed in 160 to 180 days, according to Volney H. Kyle, Jr., vice president of North Carolina Natural. The company expects to be distributing gas in April or May. The line will transport some 40,000 M.c.f. daily from Transcontinental Gas Pipe Line Corp.'s main line to more than 20 city distribution systems across North Carolina.

The system's main line will extend from a connection with Transco near Moorsville southeast 112 miles to a point just north of Lumberton.

J. P. Neill, main-line contractor, will set up field headquarters at Concordia about 25 miles north of Charlotte.

NPC Session Called

in hopes of ending dispute with Government. Hallanan hints settlement near.

THE National Petroleum Council will meet in Washington December 29 in an effort to settle a months-long dispute with the Government over proposed changes in the agency's operating rules.

The meeting was called by Walter Hallanan, council chairman. He pointed out that apparent agreement has been reached on suggested amendments to the council's articles of organization. He indicated the amendments might meet government restrictions and "still enable the council effectively to perform its function and meet the responsibilities assigned to it."

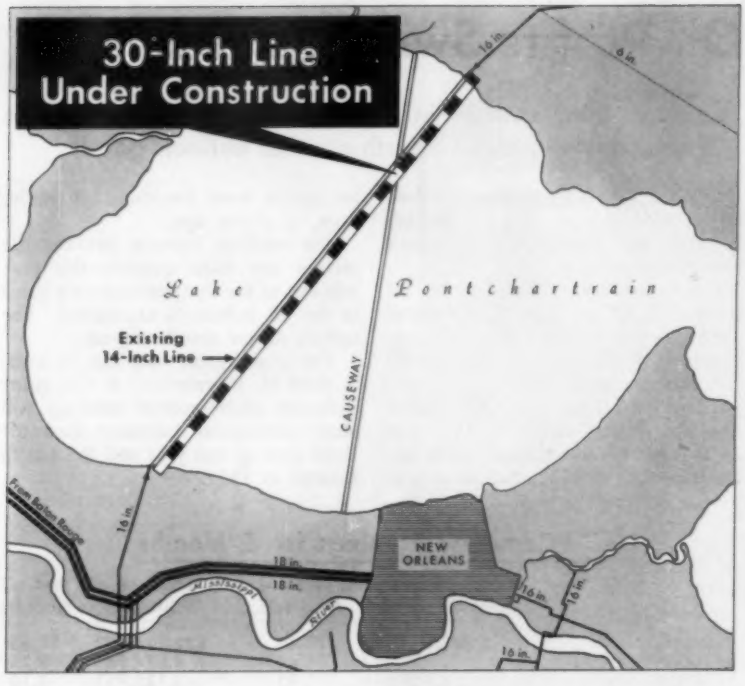
A controversy between the council and the Government developed almost a year ago when Interior Sec. Fred A. Seaton suggested stronger government control over the council's activities. The dispute has centered largely on Seaton's proposal that a government cochairman be named in line with the Justice Department's rules governing advisory committees.

PROCESSING

Asphalt sales will exceed 17 million tons this year, 7% higher than last year, and sales in 1959 should reach an "all time high," J. E. Buchanan, president of the Asphalt Institute, told the institute's annual meeting in Washington, D. C.

The Texas Co.'s new 45,000-bbl. Anacortes, Wash., refinery is in operation and first shipments of products have been made. The refinery's eight major units include a 25,000-bbl. catalytic cracking unit, a 7,000-bbl. catalytic reforming unit, and 11,000 bbl. of catalytic hydrogenation. A 1-mile-long dock with 50-ft. draft will accommodate the largest supertankers.

A new refrigeration-type gasoline plant will soon be built by Shell in



30-Inch Line Wades Into Ponchartrain

JUST 17 years ago in 1941, United Gas Pipe Line Co. wrote industry headlines with the then longest underwater pipeline crossing ever attempted.

This was its record 27.8-mile 14-in. crossing of Lake Pontchartrain in South Louisiana.

Last week virtually unnoticed, United Gas Pipe Line went about doing it again—this time with 30-in. The crossing is a segment of the first phase of construction on the company's new 30-in. line from southeastern Louisiana to Mobile, Ala. Dredging has been under way for several weeks, and pipe laying has now begun.

Operations are being conducted from the southeastern shore due to seasonal north winds.

Construction contract is held by O. R. Burden Construction Corp.

Strike Talk Grows

in OCAW ranks but Knight still hopes for an offer.

THE OCAW will be in position after the first of the year to stage a nation-wide strike.

Union President O. A. Knight said last week that the union's 600 contracts with oil firms covering 100,000 workers will be terminated by then, clearing the way for strike action.

Knight said, however, "I hope there will be a pattern-setting offer in the near future. But we are determined to win one, by collective bargaining if possible or by picket lines if necessary."

Strike votes throughout the union are carrying by well over 90%, Knight said. He said, however, that the OCAW has not yet exhausted all bargaining possibilities.

"There are some places where we are having difficulty in restraining our people until those possibilities are fully explored, but we will try our best to avoid any premature action."

Meanwhile, 10,000 Indiana Standard employes belonging to Central States Petroleum Union in 18 states will take strike votes by December 22. The strike votes involve Indiana Standard facilities in seven states, including four refineries. CPSU is asking a 7.5% across the board wage increase which management has refused as not economically justified.

Independent Petroleum Workers of America, representing 6,000 employes at Indiana Standard's Whiting refinery, agreed to join CSPU in case of a walkout.

BRIEFS . . .

Mississippi's Little Creek gas field. Initial capacity will be 5,000 M.c.f. daily. This may be doubled later. Daily recovery of about 15,000 gal. of liquids is expected. The plant will be 10 miles northeast of McComb in Pike County.

More than a billion pounds of lubricating greases and fluid gear lubricants was produced in the United States in 1957. The figure is based on the first such survey ever conducted by the National Lubricating Grease Institute. Grand total for all six categories of lubricating greases was 581,879,828 lb. Total for fluid gear lubricants was 473,999,270 lb.

Marketing activity of D-X Sunray has been expanded through acquisition of the 200 outlets of Gafill Oil Co., South Bend, Ind. The deal includes 20 bulk stations and more than 150 stations and dealer accounts in Indiana and Michigan. Annual gallonage of Gafill is about 25 million. D-X Sunray has formed a new subsidiary called Gafill D-X Oil Co., with headquarters at South Bend. J. Bruce Gafill, president of the old Gafill company, will retain ownership of the bulk of the real estate.

Also for Refiners . . .

IN THE NEWS: Committee of Interstate Oil Compact says imports are hurting conservation efforts of states, favors a stiffer government control program (p. 43) . . . Union Carbide buys Carthage Hydrocol plant and will convert it to petrochemicals (p. 48) . . . American Petrofina experiments with a service station on wheels for the shopping-center trade (p. 49) . . . Army sides with Air Force by endorsing concrete airfield paving instead of asphalt (p. 51) . . . Octane quality of gasoline moves up slightly (p. 51) . . . Final problems holding up sale of UOP may be cleared within a week (p. 51) . . . Government files antitrust suit against three Standard companies over marketing agreements (p. 56) . . . Strike talk grows in OCAW ranks (p. 57) . . . D-X Sunray buys Tidewater marketing facilities in Mid-Continent region (p. 61).

PLUS THESE TECHNICAL REPORTS: How Conoco treats waste water (p. 73) . . . Gas alarm for cooling-water systems (p. 85).

George Getty II
. . . Happy man in a new home

From Fog to Smog

Tidewater opens shop in Los Angeles with birthday party.

TIDEWATER Oil Co. was 80 years old last week, and it celebrated by giving itself a $10 million present—a new headquarters building in Los Angeles.

The gleaming new structure on Wilshire Boulevard was dedicated in ceremonies Friday and became officially the new operating base of the company, which has headquartered many years in San Francisco.

Tidewater moved more than 400 employes to Los Angeles, left about 100 in its purchasing, marine, and marketing traffic departments in San Francisco. Total cost of the move, including new office furniture: About $750,000.

The building's design reflects the company's optimism for the future; the six-story building was built so that another six floors can be added when needed.

Oil Profits Switch for Better

. . . in third quarter in one of the biggest about-faces in industry's history. Fourth-quarter outlook good.

OIL-COMPANY earnings improved in the third quarter—but not enough to offset poor showings in the year's first two quarters.

Combined net income of 40 oil companies fof the first 9 months of 1958 totaled $1,826,817,000, a decrease of 25% from the same period last year (see table below).

Earnings in the first and second quarters of the year ran 32% and 39% respectively behind totals for those periods in 1957, but third-quarter profits were less than 1% under those of a year ago.

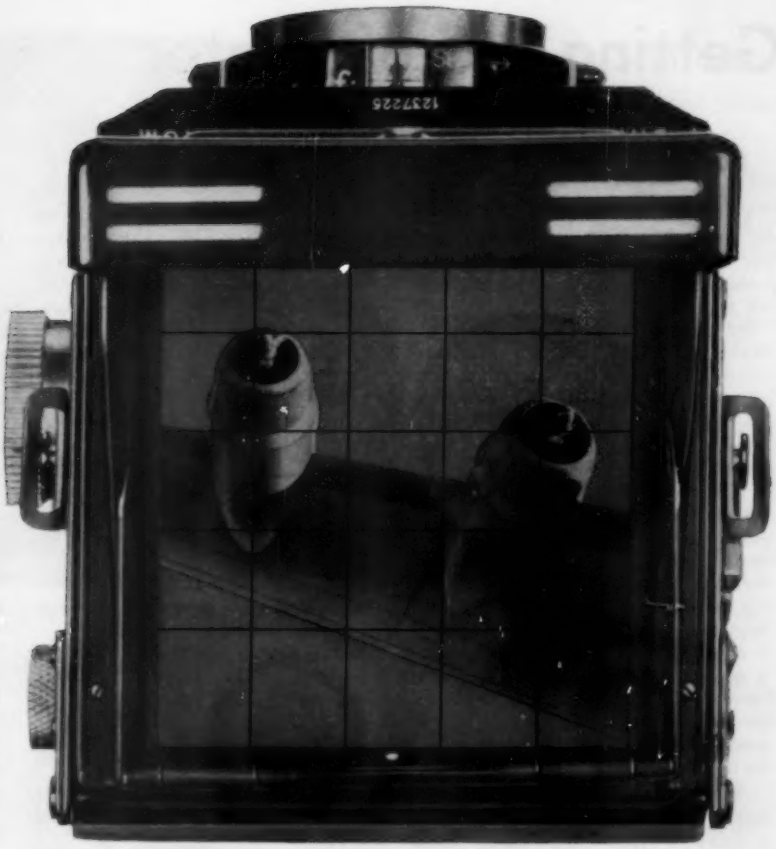
The earnings increase between the second and third quarters this year was one of the sharpest quarterly gains in the oil industry's experience. The upturn started about midyear.

The profit gains may not be over. A Carl H. Pforzheimer & Co. study indicates fourth-quarter earnings will show substantial increases over the third quarter this year and the fourth quarter of 1957.

Oil-Company Earnings for 9 Months

	Nine Months 1958		Nine Months 1957	
	Net Income	Per Share	Net Income	Per Share
Amerada	$15,527,195	$2.46	$22,294,452	$3.53
Anderson-Prichard	2,757,024	1.48	4,074,953	2.28
Argo Oil	3,757,671	1.92	4,125,951	2.10
Arkansas Fuel*	4,701,262	1.24	5,917,579	1.56
Ashland†	6,757,068	0.96	11,969,054	1.83
Atlantic Refining	19,180,017	2.02	29,293,900	3.15
Champlin	4,947,742	1.15	‡7,249,152	1.70
Cities Service Co.	§32,312,350	3.07	45,656,201	4.43
Continental	33,294,000	1.69	34,862,000	1.78
Creole*	249,018,000	3.21	318,807,000	4.11
Getty	12,557,459	0.77	15,519,213	1.05
Gulf	204,393,000	6.31	¶276,212,000	8.53
Honolulu	8,595,359	2.29	11,290,934	3.01
Imperial Oil*	34,327,000	1.09	58,421,000	1.85
International Pet.*	19,600,000	1.35	33,100,000	2.28
Louisiana Land	12,974,714	1.45	15,606,018	1.74
Midwest Oil Corp.	5,003,363	1.98	5,186,876	2.04
Ohio Oil	23,027,554	1.75	32,007,449	2.44
Phillips	57,609,292	1.68	74,227,294	2.16
Plymouth	2,876,130	1.15	5,654,544	2.29
Pure	17,416,000	2.02	26,147,000	3.04
Quaker State	1,340,110	1.62	1,590,888	1.93
Richfield	15,265,454	3.82	21,774,173	5.44
Shamrock†	6,809,486	1.97	6,531,695	1.89
Shell	78,288,743	2.58	105,797,574	3.49
Signal	8,420,000	1.68	9,287,000	1.85
Sinclair Oil Corp.	35,367,711	2.30	‖62,879,383	4.11
Skelly	17,543,927	3.05	28,231,416	4.91
Socony Mobil	115,700,000	2.39	174,800,000	3.69
S.O. California	187,743,514	2.97	211,765,184	3.35
S.O. Indiana	86,449,150	2.42	113,872,590	3.21
S.O. Kentucky	10,442,000	4.01	9,559,000	3.67
S.O. New Jersey	462,000,000	2.26	660,000,000	3.35
S.O. Ohio	**17,474,082	3.50	14,581,581	2.90
Sun	22,622,021	1.98	39,013,803	3.63
Sunray Mid-Continent	28,080,193	1.46	36,011,535	1.92
Superior†	12,779,935	30.27	14,542,822	34.44
Texaco	227,692,722	3.90	243,103,709	4.43
Texas Gulf	2,524,000	0.63	4,960,000	1.28
Texas Pacific	4,166,240	1.08	5,514,756	1.53
Tidewater	††328,000	††0.19	27,001,000	1.87
Union	20,829,766	2.65	27,675,767	3.52
Wilcox	585,619	1.92	677,307	2.29
Woodley	2,034,253	2.48	2,546,079	3.10

*Not included in totals; consolidated in parent company report. †Fiscal period corresponding to calendar period. ‡Includes nonrecurring profit of $643,125 or $0.16 per share. §Includes nonrecurring profit of $6,551,428 or $0.62 per share. ¶Includes nonrecurring profit of $30,685,701 or $0.99 per share. ‖Includes nonrecurring profit of $3,969,800 or $0.26 per share. **Includes nonrecurring profit of $3,081,044 or $0.64 per share. ††Deficit.



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SALES OFFICES: **Eastman Chemical Products, Inc.,** Kingsport, Tennessee; New York City; Framingham, Mass.; Cincinnati; Cleveland; Chicago; St. Louis; Houston.
West Coast: Wilson Meyer Co., San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.

Getting Rid of Water

. . . is one of industry's costliest problems. But research points to new ways of handling salt water successfully.

THE OIL INDUSTRY may be on the verge of making some real headway in simplifying one of its biggest problems—what to do with produced salt water.

Oil companies no longer accept as routine the older municipal water-treating methods. Instead they are searching for, and finding, new approaches and methods.

Some or all of these could be perfected in the next few years.

This was the picture drawn by two Atlantic Refining Co. engineers last week for petroleum-engineering students at the University of Texas. The Atlantic engineers are Henry Lewelling, senior chemical engineer, and Monte Kaplan, chemical engineer.

Atlantic estimates that the industry is now producing more than 6 billion barrels of salt water annually based on production figures for 1956. It produces about 2 bbl. of salt water for each barrel of oil.

This is an enormous quantity—so large, they said, that if the salt were evaporated from the water there would be 100 cu. ft. of it for every person in the U. S.

The industry must dispose of this water satisfactorily. It does not make money from it. On the contrary it costs the industry a great deal in the energy needed to produce the water, for facilities to separate it from oil, for the corrosion it causes, and finally to dispose of it.

The most satisfactory way of disposing of the water is putting it back underground. But this also is usually the most expensive method. It is here, the Atlantic engineers said, that most of the water-disposal research is directed.

What's being done . . . Lewelling and Kaplan pointed out several fields of current research endeavor in water treating, including:

. . . Sequestrants to control scale deposition. Polyphosphates, they said, have been used for years with spotty effectiveness.

Now chemical manufacturers are working to develop sequestrants whose physical and chemical properties are better suited to oil's needs. Solubility characteristics and reversion rates are being tailor-made to make these complex materials more useful.

The industry has not yet found the corrosion inhibitor it wants—a cheap one which will give 100% protection in any fully aerated brine in concentrations of 5 p.p.m. or less. However, new inhibitors are constantly appearing on the market, and manufacturers are making continuous improvement.

. . . Bacterial control. Work is under way to define the significance of bacteria from the standpoint of the economics of the problems they cause or aggravate.

Better and more specific bactericides are being developed, although a low-cost, universally usable one is not yet available.

. . . Deionization of salt water. Several organizations have been researching various means of doing this.

These efforts will mean much, if successful, in that deionization would make usable water from a waste material. So far, they said, such processes all look uneconomic. But work is continuing.

. . . Plant automation. This is beginning to show up in salt-water treating plants.

While it costs more to install a fully automatic plant than one operated manually, the difference is reasonable.

At the same time, the Atlantic engineers say, savings can be made in operating costs because less manpower is needed. Too, the automatic plant generally will supply high-quality injection water more steadily than a plant that must be operated by a pumper.

Alberta Demand Is Climbing

REFINERS plan to use an average of 347,360 bbl. of Alberta crude daily during December.

This is the best demand for Alberta crude in 9 months. It's 14% greater than the November nomination of 303,086 bbl. and more than 30% above the low month of the year, May, when refiners took only 266,505 bbl. daily.

Ontario bids showed the biggest increase—15,900 bbl. above the previous month, for a total of 146,100 bbl. All other provinces increased their take, except Alberta, which is down 1,300 bbl. for a total of 56,350 bbl.

Only one of the three U. S. refiners making nominations increased its bid. International Refineries, Inc., Wrenshall, Minn., requested 6,500 bbl. daily, 1,500 bbl. higher than last month. The other two U. S. requests are unchanged.

Line fill and working stocks for Interprovincial pipeline accounts for a 7,500-bbl. increase. Interprovincial will carry 215,924 bbl. daily, and Trans Mountain pipeline will handle 75,086.

PIPELINE BRIEFS . . .

Natural Gas Pipeline has completed in record time a 513-mile looping program along its Fritch, Tex.-Chicago pipeline. The loops, including 493 miles of 36-in., were laid in 103 days with five spreads working. The expansion boosts Natural's system to over 3,700 miles and raises delivery capacity 185,000 M.c.f. to more than 700,000 M.c.f. daily. Authority for 85,000 M.c.f. daily of increased deliveries is still pending before the FPC.

Several pipeline projects are still being bid by contractors, although it is late in the construction season. These late contracts will assure an unusually busy winter. Among jobs to be awarded are 105 miles of 12-in. for Niagara Mohawk Power, 43 miles of 30-in. for United Gas Pipe Line, 63 miles of 4 to 10-in. by Transcontinental, and 65 miles of 16-in. by Permian Basin. Coastal Transmission has let more contracts and still has work up for bid.

Expansions of 200,000 to 300,000 M.c.f. daily are planned by transmission subsidiaries of Peoples Gas Light & Coke, Chicago, for the 1959-60 heating season. Applications will be filed with the FPC by Natural Gas Pipeline for authority to move 150,000 to 200,000 M.c.f. additional gas to Chicago and by Texas Illinois for 50,000 to 100,000 M.c.f. daily. Certificates will be sought as soon as gas supply is firmed up. These volumes are in addition to applications now pending with FPC for 105,000 M.c.f. daily.

An estimated 2,000 miles of offshore oil and gas pipelines will be laid during 1959, according to a forecast by R. C. Ledford, Houston, vice president of Commonwealth Oil Co. This would double offshore pipeline mileage in the gulf. Ledford made his estimate in a speech before the Houston ASME.

The basis for increased construction

Prefab Service Station Saves Time

AMERICAN OIL CO. has taken a tip from pre-fab house builders in constructing a new service station at Haledon, N. J.

The full-size structure was manufactured in two sections and erected in a total of 10½ hours.

Unlike most pre-fab buildings, this one included all glass work, doors, lube reels, heating equipment, lighting fixtures, wiring, and plumbing lines. Hence, once in place on the site, it was a simple and quick job to make the necessary tie-ins and be in business.

A big advantage is the salvage aspect of the new station, according to T. A. Aldrige, marketing vice president. If road relocation or other reasons cause a loss of the site, the station can be unfastened, removed from the foundation in a few hours and relocated a minimum of cost.

D-X Buys Stations

from Tidewater. Deal covers all Mid-Continent outlets.

TIDEWATER Oil Co. is pulling out of the 10-state Mid-Continent marketing field and will concentrate its sales efforts on the East and West Coasts.

D-X Sunray Oil Co. will take over Tidewater's facilities in the Mid-Continent. Financial terms were not announced. The companies said only that "cash and other considerations" were involved.

Lloyd Armstrong, vice president and general manager of Tidewater's central division, explained the sale affects only Tidewater's Mid-Continent marketing interests. He said the company will continue its exploration and production programs in the central division. The company also will continue to market its Veedol motor oils and greases in the region through independent distributors.

Armstrong said product supply was a major factor in Tidewater's decision to withdraw from the Mid-Continent marketing area and concentrate its activities in the east and west. Products can readily be supplied to those areas by Tidewater's two modern refineries.

The purchase gives D-X Sunray 16 Tidewater bulk plants and 81 service stations. Nearly 75% of the stations were built since 1955 to the most modern service-station design.

---

was the belief that companies now barging crude and distillate will turn to joint-interest pipelines as a more economical means of transportation. Commonwealth is engaged in offshore construction and operates two offshore gas lines.

Lone Star Gas has started pumping gas into its new Ambassador field storage project in Clay County, North Texas. The project, Lone Star's fifth in Texas, will hike the company's available total storage capacity by 1½ billion cubic feet.

Three new gas-gathering and compressor systems will be built in Monroe field, Louisiana, by Tionesta Pipelines, Inc., Louann Gas Transmission Co., and Pedex Gas Transmission Corp. The projects to be known as the Pedex, N & W Corp., and Farrell systems, will cost $1,002,000 and will handle 16,000 M.c.f. daily. Deliveries will be made to Texas Gas Transmission at 5 cents per M.c.f.

Tionesta, with an undivided 35% interest in the systems, was recently organized by Erie Natural Gas Co., Inc. Shares of Tionesta will be distributed to Erie stockholders as a stock dividend.

Northwest Oil & Refining has completed the first unit of a crude-blending station at Chatham, Wyo., to provide an outlet for Wyoming black asphaltic crude. The station can handle 2,000 bbl. daily and will be expanded to 10,000 bbl. daily. The Chatham terminal, the first of several to be built by Northwest in Wyoming and Montana, will serve Four Bear field, which has been shut in.

Consumers Power Co. will install a 5,400-hp. compressor station at Northville gas field in Michigan. The affiliated Michigan Gas Storage Co. also plans a 5,400-hp. station at Overisel gas field. Both projects, contracted to J. F. Pritchard Co., will be completed by September 1, 1959.

Also for Pipeliners . . .

IN THE NEWS: High court will decide FPC's price-fixing authority (p. 48) . . . United Gas Pipe Line starts crossing Ponchartrain with 30-in. line (p. 57) . . . Transco makes its third crossing of Hudson into Manhattan (p. 65).

A complete list of pipeline projects is carried in the last issue of each month. Current projects are reported in Pipeline Briefs.

PLUS THIS TECHNICAL REPORT: How Interstate uses deep ground beds to protect bare pipelines (p. 94).

Jefferson Completes New Ethylene Unit

ONE UNIT is on stream and another is nearing completion in Jefferson Chemical Co.'s big expansion program at Port Neches, Tex.

The newly completed ethylene plant will triple Jefferson's ethylene capacity. A direct oxidation plant for production of ethylene oxide will be finished within a month.

Later, a chlorine-caustic unit will be ready for operation, along with an ethylene-glycol plant. The expansion program will wind up early next summer with completion of the propylene glycol and propylene-oxide units.

The expansion, which began 2 years ago (OGJ, Nov. 19, 1956, p. 147), will double the plant's capacity for ethylene glycol, increase by 50% production of ethylene oxide, and enable Jefferson to enter new fields based on ethylene and propylene.

Jefferson is owned jointly by The Texas Co. and American Cyanamid Co. Refinery gas stream from Texaco's Port Arthur refinery is cracked in the new ethylene unit.

Alaskan Well Dry

but Kenai area still looks good. Second well testing.

ALASKA'S Kenai Peninsula has come up with a dry hole, but it has taken little away from the area that has Alaska's only producing oil well.

Standard Oil Co. of California, operator, has moved a rig from the Swanson River Unit 3 to the Unit 2 for production tests. The Unit 2, reportedly a commercial well, is about a mile west of Unit 3 and about 2 miles south of the discovery well, Swanson River Unit 1.

California Standard also has staked location for a fourth well, the Swanson River Unit 4. No plans for drilling the well have been released, but the site is about a mile southwest of the discovery.

The Unit 3 was abandoned after reaching a total depth of 11,653 ft. The operator has been fishing at total depth for several weeks. The well was plugged back to 4,000 ft. and redrilled to 4,415 ft. before it was abandoned.

Seismic work planned . . . Activity also has been scheduled in Cook Inlet, which borders the Kenai to the north. Ten major companies plan to start a joint overwater seismic survey in the inlet soon.

Participating in the survey will be Standard of California, Ohio, Pan American, Shell, Sunray Mid-Continent, Superior, Texaco, Union, Western Gulf, and Richfield. (See related story on p. 44.)

the JOURNAL *said* . . . . .

50 years ago

December 20, 1908

Notice has been received by operators that Secretary of Interior Garfield has ruled that the regulation heretofore adhered to by the department limiting the amount of land that could be leased for oil or gas purposes by any one person or company to 4,800 acres has been abrogated except as to restricted Indian land.

There will hereafter be no limit to the number of acres of unrestricted land that can be leased.

The Chamber of Commerce Journal of Yokohama, Japan, reports the production of petroleum in Japan during the first 6 months of 1908 as 27,915,197 gal., as compared with 28,726,177 gal. in the corresponding period last year, a decrease of 810,980 gal.

25 years ago

December 7, 1933

The resumption of motor car buying is good news for the oil industry. November sales of new passenger automobiles approximated 108,000 units, exceeding sales in the same month for the past 3 years, 16% above November, 1930, totals; 42% over November, 1931; and 145% above November, last year.

With the allowable production of oil in the United States pegged at 2,210,000 bbls. per day in December by the Federal Oil Administration, producers entered the December period with a production total very close to that figure.

The producing situation in all the fields in the country appears to be well in hand with the exception of East Texas. That field is said to be producing from 20,000 bbls. a day upward of unreported oil. Estimates of this unreported or "hot" oil run as high as 80,000 bbls. a day.

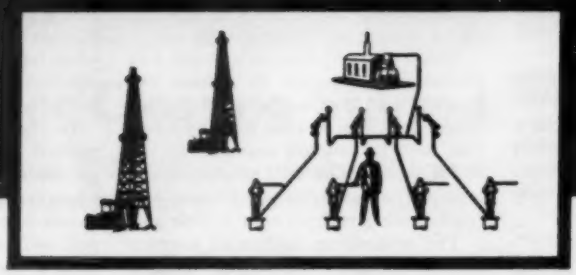
10 years ago

December 9, 1948

The Soviet news agency Tass has announced that Soviet Union technicians are the first to extract gas from oil shale on a commercial scale despite predictions of capitalist technicians that the project would fail, and that gas is now being delivered to Leningrad through a pipeline from Estonian shale fields.

The State Department last week formally notified the Hungarian Government that its seizure of American oil properties on the pretext that the Hungarian-American Oil Co. (MAORT), a Standard Oil Co. (N. J.) subsidiary, had committed "industrial sabotage" was considered illegal and Hungary would be held responsible for the continued operation of the properties and for the value of the assets of the companies.

WATCH SARGENT PUMP PERFORMANCE



UNDER THE TOUGHEST FIELD CONDITIONS

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The outstanding features of the Sargent rodless, long stroking, free or conventional design hydraulic pumps are: • More volume • Wide selection of proven metals and design • Higher efficiency in gassy wells • Simple, yet rugged construction • Service in the fields (at the point of operation).

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—U. S. Supreme Court

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Gas Peril Eliminated

. . . for Canadian drilling crews. Mobil chemist finds ammonium hydroxide will neutralize deadly H_2S fumes.

ONE serious hazard for Canadian drilling crews—hydrogen sulfide fumes—has been eliminated by a chemical-control process perfected by Mobil Oil of Canada, Ltd.

Presence of hydrogen sulfide fumes during drill-stem tests for years has been a nuisance and peril to crew members in the sour-gas country of Canada. The deadly fumes have killed many workers, injured others. Cost of combating them has been heavy.

But now a Mobil chemist, J. W. Messenger, has demonstrated in tests in the Wimborne area of Alberta that ammonium hydroxide put down the drill pipe solves the problem.

The hydrogen sulfide is removed as ammonium sulfide. The result is that trips now can be made more safely, quickly, and economically with drill pipe filled with sour fluids.

Mobil has turned over details of the discovery to the petroleum industries of Canada and the United States as a public service. The discovery comes as a boon not only to the oil and gas industries of Alberta but also to long suffering citizens as well.

The problem . . . The danger of hydrogen sulfide poisoning during drill-stem tests is well known in Canada.

For example, in Alberta last year, four workers were killed and 100 others required medical treatment after contact with the gas.

The danger develops like this. During a typical drill-stem test in a deep well, a water cushion is usually used. The produced sour gas bubbles through this water cushion, saturating it with hydrogen sulfide. Finally hydrogen sulfide is produced with the gas, leaving the string full of poisonous gas and water.

Under ordinary circumstances, once the drill-stem test has been completed, the pressure is removed from the drill stem and the pipe is pulled from the hole. Each stand of drill pipe contains lethal quantities of hydrogen sulfide. Once the water cushion is encountered, the release of pressure will cause a blow.

A mud box is used to deliver the hydrogen sulfide saturated water to the sump, but much of the gas escapes and runs under the rig. In winter this water freezes. Then its hydrogen sulfide gas is released during subsequent periods of warm weather. This also is true of water delivered to the sump. Many workers have been overcome or killed by gas from these two sources.

When the drill pipe is being withdrawn, hazards on the rig floor are even more severe. Crew members often have used small canister-type gas masks containing activated charcoal. But they were not entirely effective.

More recently gas masks with forced air supply have been introduced. These masks weigh 39 lb. and are cumbersome. Cost of compressed air for the masks on a single well has run as high as $500.

The solution . . . The ammonium hydroxide process was first tested in August 1957 at Mobil's Wimborne 13-14 during a drill-stem test.

Ammonium hydroxide solution was chosen in preference to sodium hydroxide solution because of two properties. It will neutralize hydrogen sulfide both in solution and also in the vapor phase. The free ammonia gas boils off a concentrated solution and reacts with free hydrogen sulfide gas.

The ammonium hydroxide solution was prepared by diluting 26° Baume aqua ammonia with one part water. It was then poured down the drill pipe.

A mine safety appliance hydrogen sulfide detector was used to detect the gas. Before application of the aqua ammonia, the hydrogen sulfide was so strong it could not be measured. After treatment, 10 "sniffs" showed no hydrogen sulfide.

Residual ammonia gas was removed by washing the drill stem with water from the wash-up hose. After this treatment, the drill pipe being pulled was racked completely free of either ammonia or hydrogen sulfide gas.

When fluid portions of the drill-stem test were encountered, it was not possible to neutralize the hydrogen sulfide by pouring the ammonia solution down the drill pipe. The crew then had to wear gas masks to be completely safe. As the stands were set back, however, ammonia was poured into the drill pipe from the top, and the hydrogen sulfide remaining was neutralized.

Later tests by Mobil developed two methods of applying aqua ammonia which are safe and effective.

In the first method, aqua ammonia is applied to drill pipe containing sour gas but no liquid. A pump-out sub is included in the string and opened when liquid is encountered. The noxious liquids then are pumped into the test pit.

In the second, aqua ammonia is applied to drill pipe containing sour gas but no liquid. Gas masks are worn when liquid is encountered. Aqua ammonia is used to neutralize the hydrogen sulfide in the drained drill pipe after it has been racked.

In either method dangerous concentrations of hydrogen sulfide can be kept off the rig floor, from under the substructure, and from the sump.

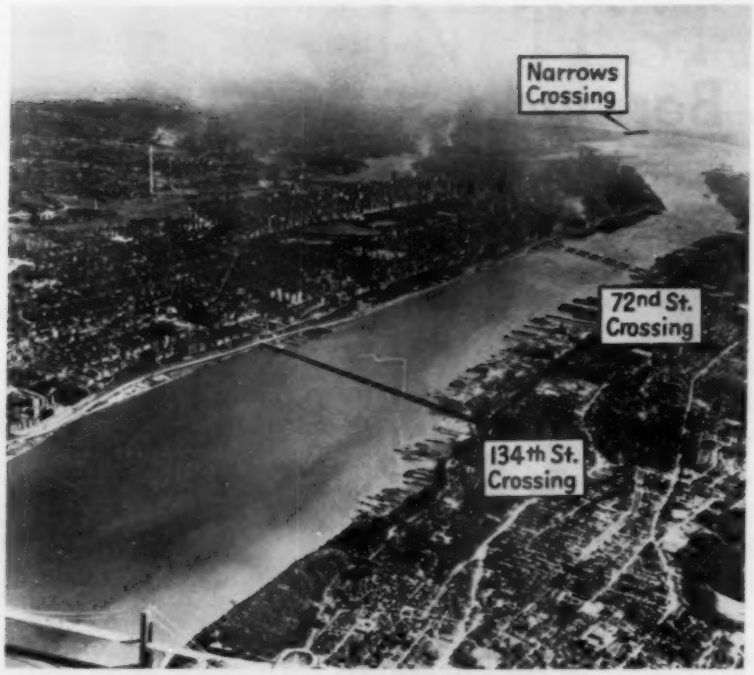
INDUSTRY BRIEFS . . .

The November 29 meeting of Texas Gov. Price Daniel's oil-imports study commission has been postponed and reset tentatively for December 13 in Austin. The commission will meet to review a subcommittee report on the findings from four hearings in various parts of the state and on its recommendations for state action. The meeting was postponed due to conflicts with schedules of several commission members.

The name of McColl-Frontenac Oil Co., Ltd., may be changed to Texaco Canada, Ltd., to more closely identify the company with its products trade name, Texaco. McColl-Frontenac is an integrated Canadian firm owned 65% by The Texas Co. If shareholders approve the change, the new name will go into effect February 2. The Texaco sign has been used on the firm's service stations for more than 10 years.

A drilling program in the Arctic area of Canada is planned next winter by Amerada and Ohio Oil Co. The two companies have signed an exploration agreement with Canadian Superior and Canadian Husky covering 3,850,000 acres in the Eagle Plain and Ogilvie basin areas of Yukon and the Peel Plateau area of the Northwest Territories. Superior and Husky will retain a working interest in the acreage.

An offset will be drilled to California Standard and Humble's good offshore discovery 9 miles southeast of Santa Barbara (OGJ, Nov. 24, p. 52). The second well will be a directional hole drilled from the same 25-well permanent platform. On another



Hudson River Crossing Started

. . . as Transco continues $167-million expansion. Program will push system's capacity above 1 billion cubic feet.

TRANSCONTINENTAL Gas Pipe Line Corp. is dredging a trench across the Hudson River for twin natural-gas pipelines.

Transco will lay two 24-in. parallel pipes under the river, crossing from North Bergen, N. J., to Seventy-second Street, Manhattan. The new lines will be Transco's third Hudson crossing, linking the metropolitan area with the Gulf Coast.

The river is 4,200 ft. wide at the new crossing, with a maximum depth of about 50 ft. Dredging operations for the trench—to be 25 ft. deep and 20 ft. wide—will require 4 months. Laying the pipe will take another 30 days. Completion target is the end of April. Dredging started late last month.

The new crossing is part of a $167-million expansion program to complete looping of Transco's system from Gulf Coast producing areas to the New York City-New Jersey-Philadelphia markets (OGJ, April 7, p. 108, and Sept. 15, p. 110). Transco also plans to build a third pipeline parallel to the other two (OGJ, Oct. 27, p. 55). The $167-million program will increase Transco's daily capacity by 238,000,000 cu. ft. to 1,191,000,000 cu. ft. for the entire system.

Transco also is doubling its storage gas available from 136,000,000 to 340,000,000 cu. ft. daily with participation in the development of the Leidy underground gas-storage reservoir in Clinton County, Pennsylvania (OGJ, March 24, p. 95). Transco, with 25% interest in the project, will own 15,000,000,000 of the 60,000,000,000 cu. ft. of gas available in the storage area. New York State Natural Gas Corp. will own 50%, and Texas Eastern Transmission Corp. will have the other 25%.

Transco completed its first Hudson River crossing in 1950 at Manhattan's 134th Street and delivered the first natural gas to New York City in January 1951. A second crossing under The Narrows of New York harbor, from Staten Island to Brooklyn, was completed in 1952.

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lease, the two companies reported encouraging shows of gas and condensate northwest of Santa Barbara. The company plans to drill more wells on this lease and later construct a platform for development work.

Mahala oil field in California's San Bernardino County has been purchased by General Petroleum from James Michelin, William M. Thornbury, and W. H. Geis of Los Angeles. Purchase price was reportedly $1 million. The field has nine producing wells making 300 bbl. of 26.5°-gravity crude daily. Bulk of production is on the 930-acre Abacherli lease.

Oil production in three states has been acquired by Landa Oil Co., Dallas, from F. M. O'Connor. The deal involved working interests in 17 producing wells and 1,704 acres of leases in Texas, Mississippi, and Wyoming. Bulk of the production is in Caldwell, Harris, Chambers, Fort Bend, and Wharton counties, Texas. Payment was not disclosed.

More than 1,000,000 bbl. of reserves in Wentz Clear Fork field of Pecos County, Texas, have been sold to Lipan Investment Co., San Angelo, by George D. Putnam, Midland. Deal involved eight wells and 1,400 acres of leases southeast of Girvin.

More production has been added to Sinclair Oil & Gas holdings in Merchant field, Liberty County, Texas. The new property includes a 50-acre lease and 350 bbl. of daily production from five wells. Purchase was made from J. Flaitz and R. B. Mitchell, Houston; American Climax Petroleum Corp.; and Maracaibo Oil Exploration Corp. Price was not disclosed.

The Texas Co. plans to launch a pressure-maintenance water flood soon in the "C" sand reservoir in North Withers field of Wharton County, Texas. It expects the flood in the 700-acre pool to hike ultimate recovery by a maximum of more than 1,000,000 bbl. The Texas Railroad Commission is now studying Texaco's request for approval of the flood.

Cosden Petroleum has purchased Pratt-Hewit Oil Corp. and its subsidiary, Pratt-Hewit Oil Corp. of Texas, Corpus Christi. The deal includes net reserves of 2½ million barrels of oil and 4 billion cubic feet of gas. Pratt-Hewit's net daily production is about 600 bbl. of oil and 1,000 M.c.f. of gas in South Texas.

Pemex Loses Bermudez

. . . in shuffle by Mexico's new president. Director of the country's biggest steel company takes over top oil post.

SEN. ANTONIO J. BERMUDEZ, whose name became synonymous with Pemex in the last 12 years, stepped down last week as director general of Petroleos Mexicanos, Mexico's nationalized oil industry.

He was replaced by Pascual Gutierrez Roldan, industrialist and financier best known as a director of Altos Hornos, the country's biggest steel producer.

The switch had been rumored for weeks in oil circles, but it was one of the few new appointments made by incoming President Adolfo Lopez Mateos which caught Mexico by surprise.

Also submitting resignations, as a matter of form when a new president is elected, were Bermudez' four top assistants: Jose Colomo, production; Fernando Padilla, finance; Manuel G. Leiva, marketing; and Praxedis Balboa, administration and legal. There was no word from Mexico on whether the resignations would be accepted or whether the four would be reappointed to their posts.

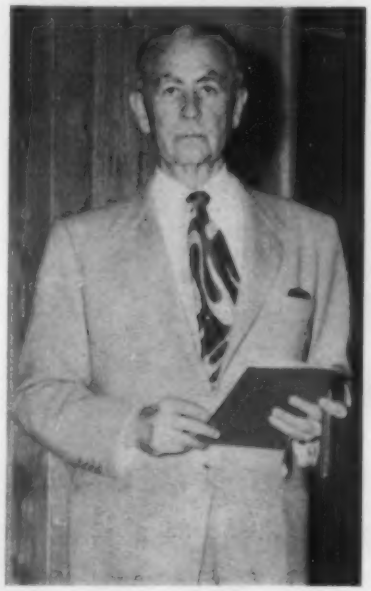
Bermudez' special assistant, Rafael Michel, reportedly resigned earlier to join J. de la Garza's drilling contracting firm.

In another Latin American political development, it was announced last week that Dr. Carlos Perez de la Cova, Venezuela's former Minister of Mines and Hydrocarbons, will be returned to Washington as Minister Counsellor for Petroleum Affairs at the Venezuelan embassy. Dr. Perez was replaced in Venezuela's top oil post late in November (OGJ, Dec. 1, p. 95).

The Washington post is the job held by Dr. Perez before he was called to head up the Venezuelan oil regulatory agency less than a year ago in the postrevolutionary period. Dr. Eduardo Acosta, who replaced Dr. Perez in Washington, will return to Venezuela and a new post in the ministry there.

Product prices hiked . . . Ironically, the Bermudez departure came just a day after Pemex announced price increases for two grades of gasoline in Mexico.

Increased product prices to give the nationalized industry more working capital has long been a Bermudez project. Trying to build a vigorous and expanding oil industry in a country hampered by government-depressed product prices has been one of the senator's biggest problems.



Antonio J. Bermudez
. . . Long oil service ended.

Mexico's top grade of gasoline, 90-octane, went up 3.2 cents to 32 cents a gallon. An intermediate grade was increased 1.6 cents to 25.6 cents. The 17.6-cent price tag for the country's lowest grade gasoline, about 70-octane, remained unchanged.

The Bermudez record . . . Most observers believe the change in top Pemex management will have little effect on Mexico's oil industry unless Gutierrez Roldan changes policies radically.

There will probably be no changes in Pemex's top echelon of trained operating personnel. Banks and supply companies who have relied for years on Bermudez to insure credit extended Pemex may watch the new director general warily for a time.

Independently wealthy and highly respected, Bermudez is credited with creating a working oil industry for Mexico even by those who are inclined to discount the industry's progress. He began his political career as mayor of Ciudad Juarez and then became treasurer of the state in 1945. A few months later he was named head of Pemex and held the post through the administrations of two presidents.

When Bermudez took over Pemex, the country exported most of its crude production and imported nearly all its products. Today that has been reversed. The first 6 months of this year Mexico's imports averaged only 18,500 bbl. daily. As of October 1, the output of the country's refineries was more than consumption and the country began to export a volume of products in excess of its imports.

The only imports now come into the country's northern border areas where transportation problems exist for domestically produced oil products.

Indiana Is Leaving Cuba

CUBAN STANOLIND Oil Co. is bowing out of Cuba after drilling three deep dusters and spending about $6 million.

The Indiana Standard affiliate has obtained a release from its farmout with Cuban Venezuelan Oil Voting Trust and Trans-Cuba Oil Co. and is closing its Cuban office. The pullout will be completed by December 31. The farmout agreement originally required the Indiana company to spend $14,750,000 in Cuba.

The Indiana affiliate abandoned its most significant test, Tortuga Shoals 1, off the south shore of Las Villas province at 9,703 ft. late in March. Tests in the Guacanayabo Bay area and northeast of Manzanillo were also unsuccessful.

France to Get New Plant

PHILLIPS Petroleum Co. and Continental Carbon Co. are forming a French company to build and operate an oil-black plant and laboratory in France.

The plant will have initial capacity of 56,000,000 lb. annually of the oil-black types now used generally by the rubber industry. Engineering and design work is nearly completed, but location of the plant hasn't been finally decided.

The basic Phillips process will be used at the plant, and the products will be distributed by Witco Chemical Co. and Phillips.

IN TESTING TOO!

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HALLIBURTON
TESTING SERVICES

Jersey and Shell Sign Argentine Deals

- **Contracts mean expenditure of $100 million during the next 10 years. Government still must ratify agreements.**

THE WORLD'S two biggest oil companies are going into Argentina under President Arturo Frondizi's no-concession-but-a-contract plan.

The two, Standard Oil Co. (N. J.) and Royal Dutch-Shell, are the only two private oil companies which now hold small concessions in the country. Both have been nursing declining production since oil was nationalized in the late 1930's.

The agreements, made with Yacimiento Petro'era Fiscales (YPF), national oil agency, have to be ratified by the Argentine Government. The contracts call for the two companies to spend about $100 million in Argentina in the next 10 years.

Shell's contract is radically different from any signed by Argentina so far. Jersey's agreement follows the general pattern of Pan American International's contract signed earlier.

Shell's agreement . . . Shell's pact provides for exp'oration, development, and production with YPF.

The area involved is in the region of the Rio Negro, near the city of Bahia Blanca, along the east coast of Argentina. It covers approximately 11,500 sq. miles.

Unlike other contracts, which cover proved or semiproved areas, this is an area that has never been fully explored.

The area will be reduced progressively to 10% of the original acreage over the term of the contract.

Shell plans to begin active operations within a very short time and plans to spend $28 million over a 10-year period.

The expenses of carrying out the operations will be repaid to Shell as oil is produced. Shell will be paid off in quantities of oil equal to the value of the expense. This oil will be turned over to the Shell Co. of Argentina or Diadema Argentina, refining and producing affiliate of Shell.

The remainder of the crude produced will be divided equally by Shell and YPF.

The Shell company, Diadema Argentina, produces 7,780 bbl. daily from properties in the Comodoro Rivadavia region of Argentina.

Jersey terms . . . Jersey's contract was made through two subsidiaries, Esso Anonima Petrolera Argentina (SAPA) and Esso Argentina, Inc., a newly organized company.

Esso's area covers 1,185,000 acres in Neuquen province, where SAPA already has two fields producing 321 bbl. daily.

Under the agreement, YPF retains title to all oil and gas. YPF will pay Esso Argentina on a fee basis in pesos. This fee is related to the price in dollars of equivalent crudes at three reference points, Venezuela, U. S. Gulf Coast, and the Persian Gulf.

An initial fee, which will vary according to that formula, has been set. It calls for $1.82 per barrel for production up to 12,600 bbl. daily; $1.78½ per barrel for production between 12,600 bbl. daily and up to 25,200 bbl.; and $1.74½ for all production over 25,200 bbl. daily.

Pesos not needed by Esso Argentina for local operations can be converted into dollars.

During the first 3 years of the contract, Esso agrees to spend a minimum of $10 million. If Esso decides to continue the contract then, it must spent at least $13 million during a second 3-year period.

At the beginning of a third period of 4 years, if Esso stays in the deal, it must give up half the area and then have a minimum expenditure formula that is based on reserves discovered.

As an example, Esso would have to spend $24 million in that 4-year period if reserves have been discovered to support production of 25,200 bbl. daily. The expenditure commitment would be reduced proportionately if Esso hasn't discovered that much.

There is no expenditure commitment in the final 20 years of the 30-year contract, but Esso must reduce its acreage to 25% of the original area at the beginning of the final 20 years.

Esso also agrees to finance and build a 390-mile pipeline to cost not more than $23 million from the Neuquen oil fields to Bahia Blanca. This pipeline will be owned and operated by YPF, which will repay Esso the cost in dollars in 30 annual instalments at 5% interest.

SAPA will continue to operate the two Neuquen fields, but their status will change from perpetuity to the life of the 30-year contract. SAPA also will turn over to YPF its four fields in Argentina's Salta province which produce 441 bbl. daily.

There is a provision in the contract that both parties agree to consider from time to time the possibility of extending Esso Argentina's exploration and producing activities to other areas.

Phillips Hits Twice in Lake

PHILLIPS PETROLEUM CO., heading two separate groups of companies new to Lake Maracaibo's oil play, has established two new major lake fields 24 miles apart.

The well is farther south and west than any production in the lake.

The first strike was LPG 14-3 in the southern quarter of Block 17. The well tested 6,000 bbl. daily of 33.8° gravity crude. The Eocene pay section was reported as much as 450 ft. thick. It is a 1¾-mile offset to the initial Phillips producer on the block.

A second discovery was LSG 16-2 in Block 10. It was completed in the Eocene flowing 3,336 bbl. daily of 18.5° gravity crude through small choke. The wildcat is 9½ miles east of Santa Maria field, found earlier this year by Phillips at the western edge of the block.

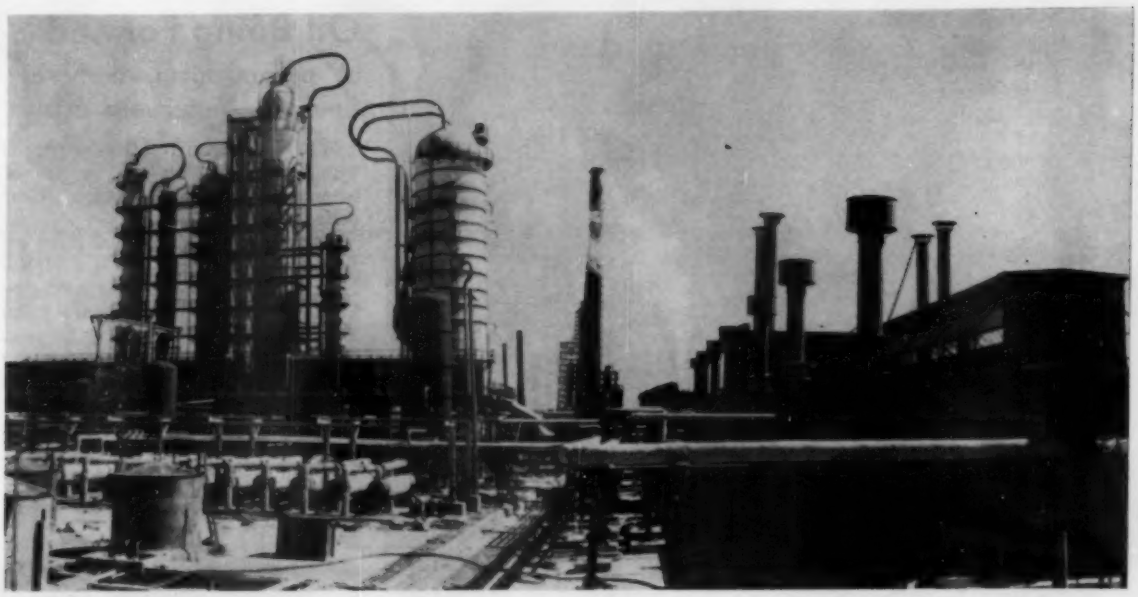
WORLD

A tanker terminal opened by British Petroleum on the West Coast of Scotland can handle the largest tankers afloat. Crude is shipped by pipeline from Finnert across Scotland to BP's Grangemouth refinery on the Firth of Forth. The line was built earlier to serve a smaller terminal nearby.

A wildcat will be drilled soon in Lower Austria near Texing in the Scheibbs area. The test will be drilled jointly by British Petroleum and the Austrian oil agency, Osterreichische Mineralolverwaltung (OMV).

Concessions in Eastern Venezuela covering 17,000 acres have been given up after being held for years by Vimex Oil, a subsidiary of Venezuela Syndicate. No wells were ever drilled on the tracts.

The fourth Libyan wildcat of Mobil Oil of Canada has been spudded in Block 10 at Sidra, near the Mediter-



First Unit Operating at Chinese Refinery

A COMBINATION crude distillation unit is the first unit placed on stream at Communist China's Lanchow refinery, billed as the first big modern oil refinery to be built on the Chinese mainland.

No capacity figures were cited by Chinese sources, but it is estimated the facility has a 40,000-bbl. capacity.

The project was designed and is being built with the help of the Soviet Union. Major machinery and equipment were supplied by the USSR. Although not highlighted in the formal announcement, a catalytic-cracking unit can be partially seen beyond the stack in the photo. This is evidently a Russian unit quite similar to Socony Mobil's thermofor catalytic-cracking plants.

Plant construction was begun in April 1956. It was originally scheduled to go into operation at the end of next year.

BRIEFS . . .

ranean coast. The rig was skidded 65 miles westward from the Wadi ben Guaad 1 test, which was abandoned at 8,840 ft.

The first shipment of Venezuelan crude ever made by Signal Oil & Gas has left Lake Maracaibo. The 155,000-bbl. load came from the lake's Centro Lago field on Block 4, where five wildcats and one development well have been completed as producers. Two more are drilling. Partners in the block are Hancock Oil, Pure Oil, and Standard Oil (Ohio) (OGJ, Nov. 17, p. 147).

Russia's first 40,000-ton tanker will be launched soon from a Leningrad shipyard. The vessel, to be called "Peking," will be the first in a series. It will go into service next year.

An initial price of $13.90 per long ton for marine bunker fuel at the Mina Saud terminal of the Neutral Zone has been posted by Getty Oil. Bunker C sells for $15.65 per long ton at Ras Tanura and for $15.61 at Abadan. The Getty Oil bunkers come from its newly opened 30,000-bbl. refinery in the Neutral Zone.

A new 1,385-ft. dock has been opened at Cardon refinery by Cia. Shell de Venezuela. Two 54,000-ton tankers can be handled at the same time, with duplicate loading systems loading 3,000 tons per hour on board each ship.

A new Russian refinery deep in Siberia at Fergana, Uzbekistan, has partially opened. The initial output, 20 tank cars of desalted crude reportedly was shipped to nearby Sinkiang Province in Communist China.

Russia has started laying pipe for a 250-mile natural-gas trunk pipeline in the Northern Caucasus, between Stavropol and Grozny. The first section, from Stavropol to Novinnomyssk, is scheduled to open by the end of the year.

Exploration is under way in Russia's southern Moldavia region, close to the Romanian border. Several structures have been found near the confluence of the Danube and Prut rivers. A heavy rig is being set up in Lake Belau, 2 miles from shore.

Fourteen days after it blew out and caught fire, an Aguasay trend dual producer in eastern Venezuela was brought under control by Myron Kinley, Houston fire fighter.

Caro 8 blew out a month after Venezuelan Atlantic had completed the well for 1,100 bbl. daily from two zones at about 13,500 ft. The rig, destroyed in the fire, was still in place doing a workover on one of the producing zones when the blowout took place. Pancoastal Petroleum has a half interest in the Caro field.

The first African wildcat drilled by Standard Vacuum is under way 50 miles south of the British Somaliland Port of Berbera on the Gulf of Aden. A deep test, Dagah Shabell (Leopold Rock), is within a mile of an oil seep used for centuries by Somali tribesmen.

HANDSHAKE by Taro Yamashita, left, of Arabian Oil, and Wallace March, of International Drilling, follows signing of Persian Gulf drilling deal.

New Japanese Company Requests Loan

ARABIAN OIL CO. has asked the Japanese Government for a $10-million loan through the Japan Development Bank to carry the newly formed company through the first phase of testing its offshore Neutral Zone concession in the Persian Gulf.

The loan request came just a few days after Taro Yamashita, president of the company, signed a drilling contract with Wallace W. March, managing director of International Drilling Co.

Government sources in Tokyo indicated the loan will probably be approved if the Japanese industrialists who are backing the company will guarantee the loan.

Two Arabian Oil engineers are in Houston on a buying mission to purchase supplies needed for the company's first two wells. The two engineers expect to load the equipment on supply ships leaving Galveston about mid-January headed for the Middle East.

Maracaibo Drilling Planned

. . . by Continental Marine on new lake concession. Deal calls for leasing of two platforms in U. S. for program.

CONTINENTAL Marine Exploration Co., a contract drilling subsidiary of Fish Engineering Co., is making arrangements to drill for a major oil company in Lake Maracaibo and is negotiating for Middle East contracts.

Continental Marine's decision to move into the international field coincides with a change in the presidency of the company.

Paul L. Guarin, a veteran official and consultant of several major oil companies, moved in as president last week. Guarin retired in 1954 as chief engineer for drilling and production with Shell Oil Co. Since that time he has worked as a consultant in foreign and offshore operations.

Details of Continental Marine's agreement to drill in Lake Maracaibo have not been announced, but the company plans to lease at least two idle platforms in the U. S. and take them to Venezuela for drilling on new concessions in the lake.

In a bid for Middle East business, the company is conducting talks with companies active in that area.

Fish formed Continental Marine from the old Morris & Hamilton contract drilling firm, purchased in 1957.

In taking over the Continental Marine presidency, Guarin succeeds C. R. Williams, who becomes vice president. Williams has been elected vice president of Fish International Corp.

Oil Being Formed

at present time, study of field in Venezuela shows.

A UNIQUE oil research project is being conducted in the jungles of eastern Venezuela's Orinoco River delta.

A team of scientists from three affiliates of Standard Oil Co. (New Jersey) are studying an extraordinary oil deposit containing oil only 5,000 to 10,000 years old—still in the embryonic stage of its development. Oil in the average commercial well is more than 10 million years old.

Jersey Standard says the oil deposit—discovered in 1954—provides the first opportunity to observe nature in the act of creating an oil reservoir. It is the only case known in which hydrocarbons have actually begun to collect in a stratigraphic trap.

The project, conducted by Jersey Production Research Co., Tulsa; Esso Research & Engineering Co., Linden, N. J.; and Creole Petroleum Corp., is aimed at more knowledge of the origin of oil as a possible aid in future exploration.

The research team includes two geologists, a bacteriologist, a bio-chemist, and a number of field workers who handle drilling operations.

A fully equipped laboratory has been set up at a jungle outpost near the village of Pedernales for the 6-week project. The research equipment includes a portable drilling rig, special coring devices, vacuum distillation apparatus, a spectrophotometer, and 13,000 sterile bottles and syringes.

The oil sand is at a depth of about 115 ft. Core samples are being examined in the field laboratory. Some will be sealed with plastic and sent to the U.S. for further analysis in the laboratories in Tulsa and Linden. Results of the project will not be known for several months.

The researchers are convinced that at the least man's knowledge of earth science will be advanced.

Haiti Test First in Decade

COMMONWEALTH Oil Co., Houston, has spudded a well 17 miles east of Port au Prince in Haiti. The well is the first drilled on the Haitian mainland in 10 years.

Commonwealth holds six concessions in Haiti totaling 360,000 acres. The new well is located on a 56,000-acre concession in Cul Desac basin. It will drill to 7,000 ft. in the Miocene.

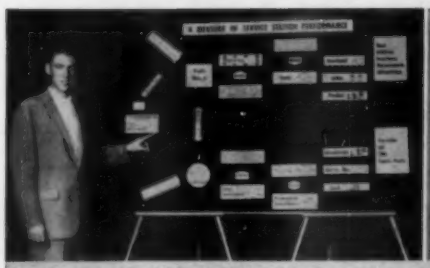
Atlantic Refining Co. drilled five wells in Haiti between 1944 and 1947. Four of them had oil and gas shows.

DU PONT *Petroleum Chemicals* NEWS

Number 93 in a Series of Bulletins for the Petroleum Industry

DECEMBER 1958

Three oil industry presentations by DuPont win first-place awards for effectiveness



"A Measure of Service Station Performance"

"What Every Woman Should Know About Her Car"

"Dollars and Sense"

TOPS FOR TRAINING: DuPont presentations for the oil industry which won first prizes in 1958 visual aids competition

Three training presentations widely used in the petroleum industry have won first-place awards in the 1958 visual aids contest of the National Visual Presentation Association.

Created as part of the DuPont sales and service program for refiners and marketers, these prize-winning presentations topped all others in three of the six categories in the Graphics competition.

All three prize-winning programs are available to oil companies for dealer orientation, service station training, or good-will showings to groups of consumers.

"A Measure of Service Station Performance" won first place in the "Employee Training" category.

It is a flannelboard presentation created to simplify and explain the economic factors which realistically measure the success of a dealer in terms of "per cent return on investment." It can be given as a three-hour discussion program, or as two 1½-hour sessions, or in short form as a 30-minute lecture. The longer versions include the use of a worksheet which helps each member of the audience to measure his own performance.

"What Every Woman Should Know About Her Car" took first-place honors in the "Public Relations – Education" class.

This "flackboard" (flannelboard and blackboard combined) presentation was created to increase greatly the public's confidence in their service station operators. It explains in simple terms the mechanical features of the modern automobile, and tells how women can keep their cars operating dependably with the help of their dealers' knowledge. It tells what must be attended to—why—and when, and convincingly shows that the cost of this regular maintenance is much lower than various types of insurance – only about 7/10¢ per mile.

"Dollars and Sense" is a flannelboard presentation which explains the everyday problems of all businesses – large and small. It won first prize in the "Employee Relations" category.

Oil helps make Christmas merrier for millions

Many of oil's chemical offspring will play a big part in making Christmas a happy occasion around the world this year.

Nylon, for example, will find its way under millions of Christmas trees – as molded parts in *Junior's train*, in *Dad's power tools*, and in an infinite variety of garments from *stretch socks* to *dolls' clothes*.

"Dacron"* polyester fiber, another product made partly from oil, will turn up in everything from *shirts* to *slacks*, *loungewear* to *lingerie*.

And many, many more products derived from oil will contribute to happiness at Christmas this year.

These products are the results of constant experimentation and research, with oil and its derivatives. At DuPont, chemistry helps turn oil into exciting new products. This spells an ever increasing demand for petroleum in the years to come.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

You ought to know...

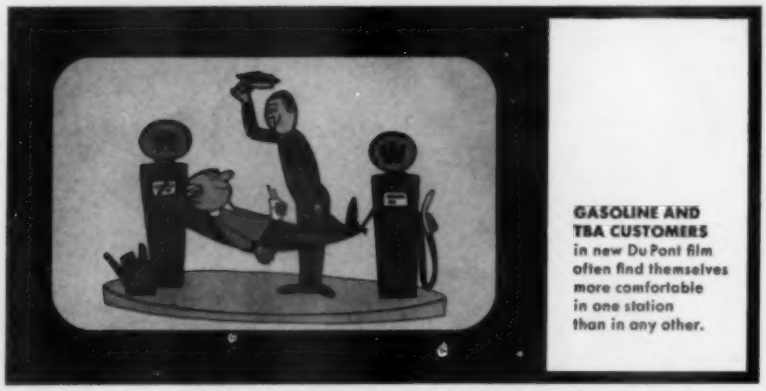
FENTON RUSSELL, M.D., has, by his own admission, "not discovered anything and has invented nothing."

Yet as a member of Du Pont's Medical Division, Dr. Russell plays a role that is of importance to every refiner who uses tetraethyl lead. Travelling distances which would amaze the busy circuit-riding doctor of the past, he works closely with refinery managements, physicians, supervisors and blenders to help them maintain the very finest health and hygiene programs.

Dr. Russell also participates in many of the Du Pont Training Programs conducted in refineries, to teach safe and proper methods of unloading and blending tetraethyl lead.

He joined the Du Pont Company in 1943 and participated in the wartime Manhattan Project at Hanford, Washington. Later he moved to the Du Pont Medical Division to pursue his special interests, Legal Medicine and Toxicology. Dr. Russell received both his B.S. and M.D. degrees from the University of Pittsburgh.

His friends know that he "loves to make a speech" – which should lend encouragement to refiners who might want to use the services of Dr. Russell to augment their own safety training programs.



GASOLINE AND TBA CUSTOMERS in new Du Pont film often find themselves more comfortable in one station than in any other.

"Know your customer" motion picture helps dealers use psychology in selling

"Gee . . . he picked my station!" enthuses the typical service station operator, in Du Pont's new full-color semi-animated strip-film.

Then he learns *why* his customers choose him . . . what makes a customer tick. The information in this 10 minute presentation is based on the nationwide survey of service station patrons which was conducted for Du Pont by psychologists from National Analysts, Inc.

In the survey—and in this screenplay – the *real* reasons for station selection are revealed. For example, the patron who drives past station after station across a city to go to his favorite dealer's because it is "convenient" is actually motivated by his feeling that this particular dealer is really interested in him and his car.

And the woman who goes to a station "because it is convenient" often has an even deeper reason – in some service stations she is treated with patience and helpfulness, not being made to feel uncomfortable in a strange man's world of mechanical mysteries.

This sound film, with its likeable characters and sprightly action, carries its message simply, with force and good humor. It is ideal for dealer-orientation meetings, for which it is readily available. Simply contact your Du Pont representative and he will arrange showings for you.

SALES OFFICES

Chicago 3—8 So. Michigan Ave. . . . RAndolph 6-8630
Cleveland 15—101 Prospect Ave. . . . . MAin 1-3422
Houston 2—705 Bank of Commerce Bldg. . . . . CApitol 5-1151
Los Angeles 17—612 So. Flower St. . MAdison 4-1354
New York 20—45 Rockefeller Plaza . . . . . COlumbus 5-2342
Philadelphia 2—3 Penn Center Plaza . LOcust 8-3531
Pittsburgh 22—1 Gateway Center . . . ATlantic 1-2933
San Francisco 4—111 Sutter St. . . . . EXbrook 2-1934
Seattle 3—4003 Aurora Ave. . . . . MElrose 2-6977
Tulsa 1—1811 So. Baltimore Ave. . . . . LUther 5-5578
In Canada—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . . . HUdson 1-6461
In Other Countries—Organic Chemicals Department, Export Division, 7447 Nemours Bldg., Wilmington 98, Del., PRospect 4-2962.

CONTINUED

First Place Awards

Purpose of this visual aid is to help improve relationships between oil companies and dealers, by helping dealers to understand our free enterprise system in the light of problems shared by business of all sizes, with some predictions about the future of the service station business.

Kits for these presentations are available, complete with detailed scripts. Any speaker can use them with a minimum of preparation.

For further information about these —or the more than 30 other sales services we offer—write to Petroleum Chemicals Division of the Du Pont Company.

DU PONT
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Better Things for Better Living
. . . through Chemistry

Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

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A-8416

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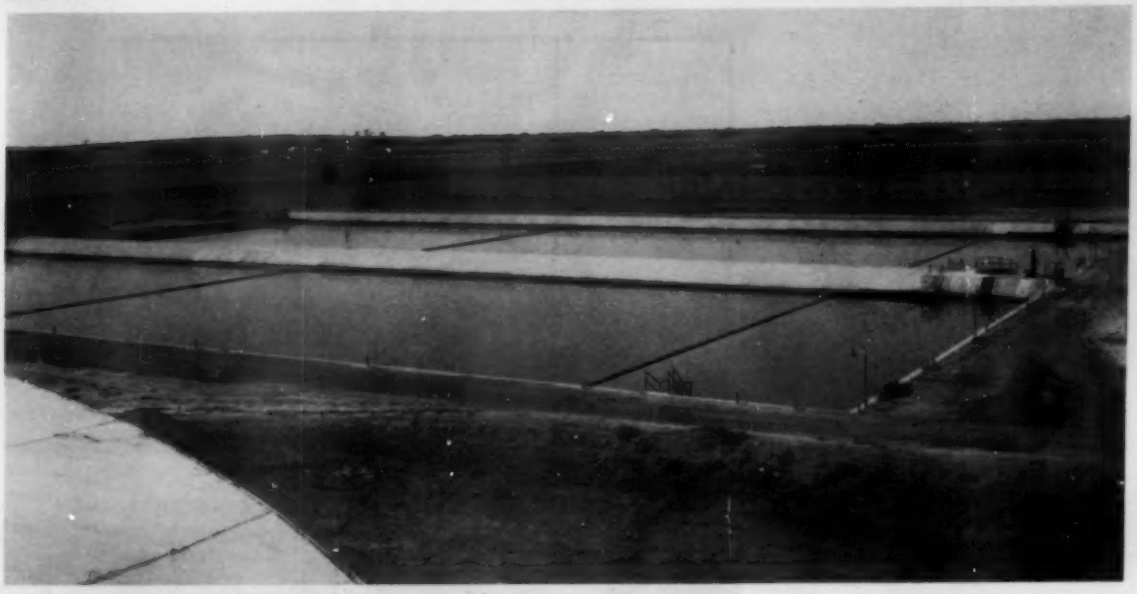


FINAL HOLDING PONDS for refinery effluent wa'er have a total capacity of 6.8 million gallons.

How Conoco treats waste water

Disposal of harmful wastes is an expensive operation at Ponca City, but it's good business and good relations.

BY C. D. HULL
Continental Oil Co.

DURING the past several years we have spent approximately $363,000 for new facilities to treat refinery waste water at the Ponca City, Okla., refinery of Continental Oil Co. These include holding ponds, steam-stripper unit, consolidation of effluent into one outfall stream, and a biological oxidation plant.

Changes in processing units and developments in the use of new chemicals make it necessary that we maintain an active program at all times to keep our effluent satisfactorily pure.

Four sections . . . The refinery of Continental Oil Co. is divided into four main sections: light oil, lubricating oil, thermal, and catalytic cracking divisions. Each division is equipped with oil-water separators for recovery of any oil present before entering the common outfall stream. There is also a series of cooling-water spray ponds within the confines of the refinery equipped with oil separation and skimming devices for recovery of any oil entering the ponds through the spray system or the return water lines.

Paper presented at WPRA meeting, Wichita, Kans.

Overflow from these ponds and water from the four division separators join in a common outfall stream which passes through a final large holding pond constructed in 1954 with facilities for removing the small amount of oil which may have found its way to this point. The holding ponds are composed of two large, parallel, rectangular basins having a capacity of 6.8 million gallons or equivalent to about 3 days' holding time.

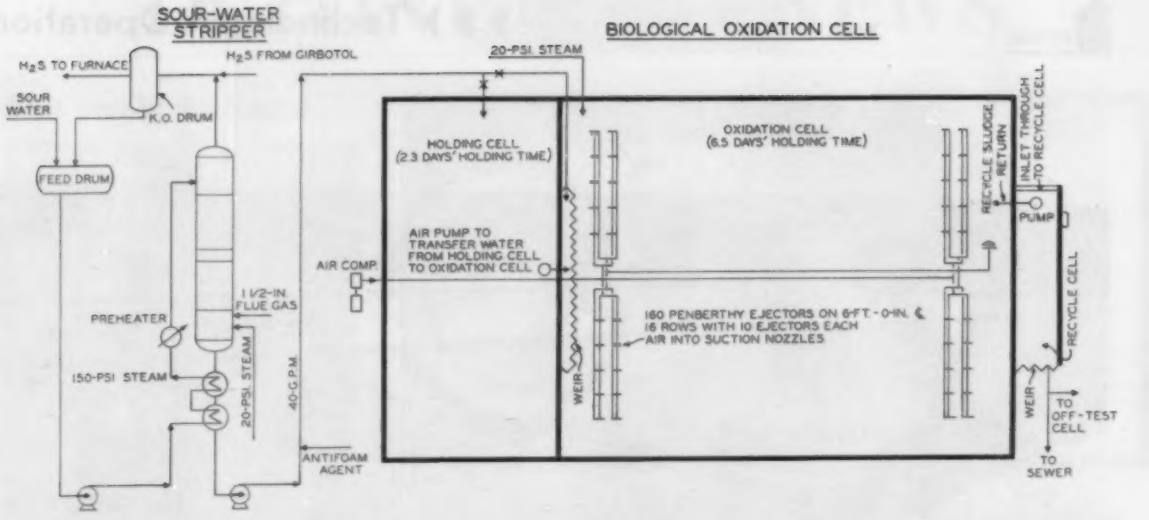
Oil separation from the water streams in the division separators and final cleanup in the holding ponds leave relatively little oil in the effluent which flows from the holding ponds to the river. Other means of oil removal, such as air flotation, have been studied; but the need for further treatment to remove oil is unnecessary.

Quick attention is given to oil spills which result from line breakage or other causes, and a vacuum truck is used to pick up any free oil before it enters the water stream.

Holding ponds . . . These permit efficient settling of suspended solids contained in the effluent water and thus effectively solve another pollution problem. Velocity through the holding ponds is materially reduced, and most of the suspended solids settle in the forebays. Accumulation of solids in the forebays is removed by diverting the water stream into one reservoir while the other is idle.

Cleaning of solids from the idle unit is done about once each week by agitation of the water and solids, then pumping of the solution to nearby settling ponds where the water drains back to the reservoir. Some suspended solids remain with the water flowing from the forebays to the main section of the holding ponds and necessitate cleaning about every 2 years. Removal of solid matter from the water reduces turbidity and improves the appearance and quality of the final effluent.

Holding ponds or reservoirs provide residence time which equalizes the harmful substances brought about by temporary operating upsets or spills. Aeration and oxidation also



BIOLOGICAL OXIDATION PLANT and sour-water stripper are two important items in the Ponca City waste-disposal setup. Photograph of oxidation cell of bio-oxidation plant is at right.

take place, and the ponds tend to become biological treating plants—the same principle provided in natural ponds and streams.

The biological oxidation plant furnishes bacteria in the overflow which helps to seed the stream to and including the final holding ponds; and tests indicate the ponds are effective in reducing the small quantity of phenols and sulfides which may come from the biological plant and from other sources in the refinery.

Solvents do not constitute a disposal problem except for eternal vigilance against leaks and spills. Other spent acids used in the refinery, such as hydrochloric, a component part of solutions for equipment cleaning, may, within reasonable limits, be included in the refinery effluent to help neutralize the normally alkaline stream.

Caustic problems . . . Caustic, used in the treatment of gasoline and distillate products, drum cleaning, and other operations, has been, and still is, a difficult problem. Spent caustic material from the treatment of cracked gasoline is rich in recoverable acid oils, such as cresols and phenols; and such materials are segregated, loaded into tank cars, and sold to a chemical company for reclamation.

Other strong caustic solutions are placed in earthen pits. Certain weak caustic solutions and other alkaline water, such as boiler treating-water solutions and boiler blowdown, are neutralized, if necessary, with sulfuric acid in the holding ponds.

pH Control . . . Studies have been made using sulfuric acid to maintain a pH value at or below 8.2 in the east bay of the existing holding pond, while the west bay was used for comparison without pH control. Our information indicates that effluent water having a high alkalinity is more likely to be toxic to fish life than effluent water with a low alkalinity and, further, that alkalinity due to sodium hydroxide is more toxic than that due to sodium salts—such as carbonate.

An instrument was installed during the past summer to record the pH of the water in and out of the holding ponds in order to study 24-hour variations and provide a definite control for neutralizing with acid, if it should be necessary.

Neutralization of alkaline water also can be accomplished by bubbling flue gas rich in carbon dioxide through the water in a packed tower. Since installation of the oxidation plant, the refinery effluent water normally has a pH of 7.6; and there is no apparent need for neutralization.

Other chemicals brought into use during the past several years or produced in refinery operations are of great concern in connection with effluent water. Sulfides and phenols which concentrate in the water phase, primarily from cracking operations, are toxic to some degree and quite harmful because of their potential to consume oxygen.

A steam stripper tower designed to operate on 100 g.p.m. of feed was installed in 1954 for the purpose of removing sulfides from the principal sour-water streams in the cracking operations. The stripper is 4 ft. in diameter, 36½ ft. high, with two 10-ft. sections packed with 1½-in. raschig rings.

The various sour-water streams were collected into a feed drum and pumped to the top of the tower through two exchangers which ex-

BIO-OXIDATION PLANT, above, with inlet cell in foreground, oxidation cell in center, and holding cell in background. At left is final sludge cell for recycling to oxidation section.

changed heat with the bottoms product. The overhead passed through a water-cooled condenser and returned to the feed drum with a vent line from the drum to the boiler furnace. Twenty-pound steam was supplied for stripping.

No provision was made for neutralizing the feed by acidification or by means of flue gas, since pilot test work had shown that 90%, or more, of the sulfides could be removed by steam stripping alone.

Ammonia removal . . . Originally, the sulfide removal was satisfactory; but it later developed that too much ammonia was being left in the effluent water for proper operation of the bio-oxidation plant without the use of considerable acid to reduce the alkalinity. The ammonia was also objectionable in the effluent water because of its toxicity. As a result, changes were made a few months ago to increase the tower temperature and decrease the tower pressure to remove more ammonia.

A preheater operating on 150-psi. steam was installed on the feed to the tower, and the overhead cooler was bypassed to decrease the pressure. This helped to some extent, but more recent changes included installation of a 1½-in. flue-gas line from the catalytic cracking flue-gas generator to the bottom of the tower for additional stripping and a change in the overhead piping to remove the vapor line from the feed drum and run it direct to the boiler furnace.

The latter change was made with the idea that recycling of ammonia was occurring, which has been confirmed.

Present operating conditions include a feed temperature of approximately 235° F., tower-bottom temperature of 215° F., and a bottom pressure of 8 psi. Twenty-three hundred pounds per hour of steam and 85 c.f.m. of flue gas are used in the stripping operation. Recent laboratory tests show:

	Feed water	Effluent water	Average per cent removal
Sulfides, p.p.m.	6,000-8,976	185-975	92
Phenols, p.p.m.	700-1,400	480-1,000	30
Ammonia, p.p.m.	4,743-6,975	724-1,519	81
pH	8.4-8.9	9.2-10.0	..

Phenol is highly soluble in water and above certain limits is toxic to fish and a possible source of maltaste and odor in water. In our refinery, phenols are present in water from many sources; but they are principally concentrated in the sour-water stream and processed in the stripper tower previously referred to. The stripper operation is quite effective in the removal of sulfides but has much less effect on the phenols.

Biological oxidation plant . . . Primarily for the removal or consumption of phenols contained in the effluent from the sour water stripping unit, a biological oxidation plant was constructed in 1957. There are two

It's important to determine chemical composition and volume from each location

general types of biological treating methods utilizing aerobic oxidation, other than lagoons, now in use in the refining industry. One is the trickling filter and the other is the activated sludge system.

The latter process was selected for our refinery because of its greater aeration efficiency or greater oxidation capacity for a given volume.

The biological oxidation plant was constructed on the site of an old coke pit approximately 80 ft. wide and 550 ft. long. Forty feet on one end of the pit was used for a feed or surge pond; the next 100 ft. for an oxidation cell; a section 10 by 40 ft. for a sludge recycle cell; and the remainder, approximately 400 ft. in length, was equipped to hold the effluent from the oxidation cell if desired.

The oxidation cell was equipped with necessary piping to evenly space 160 Penberthy ejectors on 6-ft. centers for the circulation of water and introduction of air. The recycle cell was equipped with a traveling scraper to concentrate sludge at one end, and an air-lift pump was provided to recycle back to the oxidation cell.

Exhaust steam was piped to the oxidation cell, and a temperature controller was installed for heating the water to a temperature range of 100°-110° F. Two air compressors were installed, one of 1,420 and one of 773 c.f.m. capacity, to supply compressed air to the ejectors; and a 2,000-g.p.m. centrifugal pump was provided to circulate water through the ejectors.

Changes . . . Since initial operation of the oxidation plant, a number of changes have been made, such as removal of the water-circulating pump, sludge scrapers, and steam control valve; and in addition, the feed line has been changed to bypass the feed cell—all reflected in the flowsheet.

The plant has been in operation about a year, and results are gratifying from the standpoint of phenol and sulfide removal as shown by the following recent tests:

	Feed water in	Outlet stream	Per cent removal
pH	9.2-10.0	7.0-8.6	...
Ammonia, p.p.m.	724-1,519	658-1,433	100
Phenols, p.p.m.	480-1,000	10-40	97
Ammonia, p.p.m.	724-1,519	658-1,433	Minor

It should be remembered that the sour water to the stripper tower and bio-oxidation units involve only about 40 g.p.m., which represents a potent but rather small per cent of the total refinery effluent which amounts to about 1,600 g.p.m.

Acid usage . . . Initial operations necessitated the use of 2,000-5,000 lb. of sulfuric acid a day to control the pH in a range of 8.0-8.4 for the most efficient phenol control. The high acid usage was largely due to ammonia in the feed stock, but the recent changes in the sour-water stripper unit have lowered the ammonia content; likewise, the usage of acid was cut to about 600 lb. a day.

During cold weather, it has been necessary to add about 2 lb. a day of antifoam agent to the oxidation cell, which material is dispensed in light gas oil and added to the feed stock as needed.

Sodium phosphate in the amount of 25 lb. a day is the only nutrient being added to the oxidation cell. The ammonia present serves as a source of nitrogen.

A 4-mile open ditch carries waste water from the holding ponds to the Salt Fork River. Tests made by using dye in the water leaving the holding ponds show that the water reaches the river in 16-20 hours. Analytical and bio-assay tests show material improvement in the quality of the water as a result of the natural flow from ponds to the river due to aeration and bacterial action in a flowing stream.

We frequently make bio-assay tests in our laboratory on the water stream as it leaves the holding ponds and as it enters the Salt Fork River to determine toxicity of the water to aquatic life. This method is quite valuable in detecting the presence of deleterious materials in the outlet stream.

Lagooning . . . We have done a considerable amount of pilot-plant work on lagooning. The tests have been conducted, generally, by using 55-gal. oil drums and varying holding time to determine the effect on effluent water. In all cases, holding time resulted in improvement in the quality of the water such as: reduction in pH, sulfides, phenols, ammonia, chemical oxygen demand, and immediate oxygen demand.

Lagoons also are useful in elimination of surges in the effluent due to mechanical failures and accidental spills. It appears that an ideal objective would be a series of lagoons in which fish life could always be maintained—at least in the final lagoon in the series.

Spotting source . . . It is a very important step in the control and proper handling of waste water to determine the chemical composition and the volume from each individual location in the plant. Refinery personnel make frequent visual inspections of the oil traps, holding ponds, and effluent stream; and, in addition, all personnel have been instructed repeatedly on the importance of water-pollution abatement and the necessity of segregating harmful wastes for special handling to avoid contamination.

Don't Miss . . .

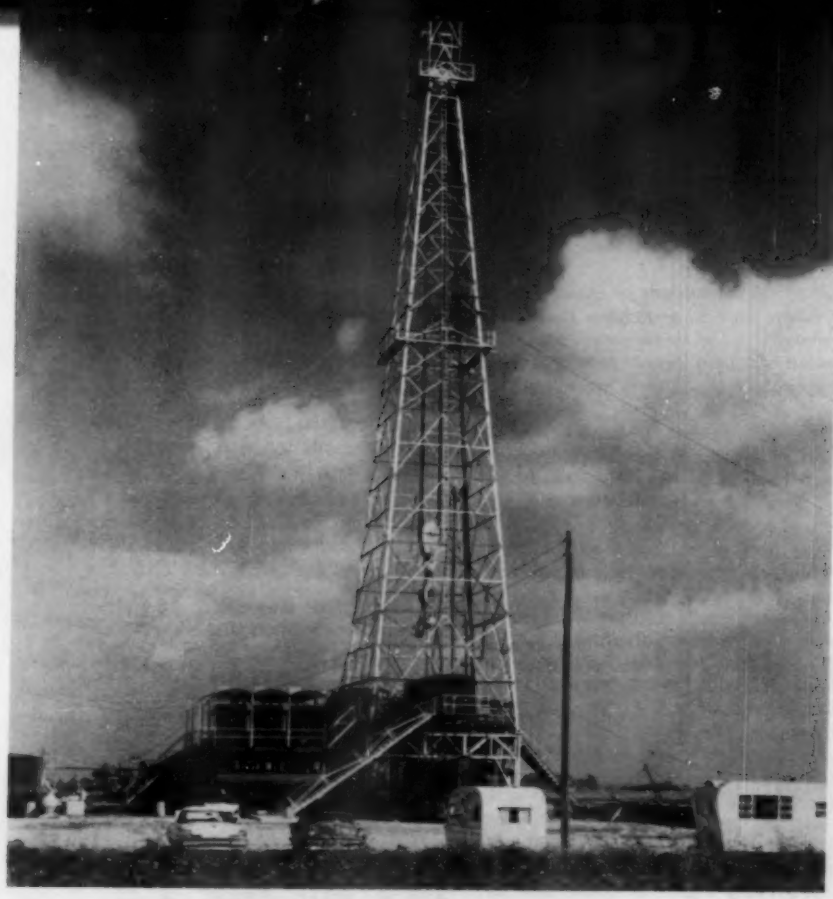
"Let's Not Sell U. S. Reserves Short"

page 80, this issue

Disposal of harmful wastes in earthen pits is an important phase of waste disposal, such as disposition of caustic solutions, clays, oily sludge, other waste chemicals, and preventing these materials from entering the effluent water stream.

Samples of water are obtained in each division periodically and sent to the laboratory for analysis. Analytical tests for pH and phenol content are made daily in the laboratory on each division stream, on the inlet and outlet of the biological oxidation unit, and the final holding ponds. More complete tests are run weekly on the division water streams and the final effluent before it reaches the river and on the river water below the point where the refinery stream enters.

Subsurface injection of refinery effluent water has been considered only to a limited extent, since it is apparent that disposal into oil-producing sands, or other sands, would present a big treating and handling problem. This method of disposal might be advantageous in certain instances.



Shell's 5 Rumberger bottomed at

24,002 ft. to become world's second-deepest well

Beckham County test is deepest yet for Oklahoma

BY W. B. BLEAKLEY
Production Editor

OCTOBER 19, 1958, will be a red-letter day on Shell Oil Co.'s calendar for a long time. And Helmerich & Payne officials won't forget it soon. On that day, drilling was completed on 5 Rumberger in Beckham County, Oklahoma, to set a new state depth record, and to make it the second deepest well ever drilled.

Located in C SW 16-10n-21w, in the heart of Elk City field, the well was spudded on July 13, 1957. Purpose: To explore the Des Moines and Springer sands. On the same day, 20-in. casing was set at 200 ft.

Brand-new rig . . . This was the first drilling job for H&P's new Rig 47, which was designed for deep exploratory drilling in the Anadarko basin. The specifications on the rig and attendant equipment were ironed out in discussions between the operator and contractor.

Rig 47 consists of an Oilwell 96-16 draw works, three 675-hp. Superior 8 G 825 gas engines on an Oilwell 1600 compound, and two Oilwell 816-P 700-hp. pumps. The rotary table is driven independently by a 250-hp. engine through a torque converter.

A third independently powered pump is used for mud mixing. This gives the rig over 2,000 hp. available for hoisting, 1,800 hp. for continuous pump duty and 250 hp. available to the rotary.

The rest of the rig is balanced to the size of the draw works and engines. The derrick is rated at 1,000,000 lb. and the substructure at 1,400,000 lb. The overhead string is equally heavy with a 1⅜-in., 7-sheave, 580-ton crown block, 1⅜-in. 6-sheave 480-ton travelling block, and a 450-ton hydraulic cushion hook. The rig was equipped for modern deep drilling with a Dynamatic brake, Brantley drilling-feed control, Kelco air slips, and Hydril pulsation dampeners on the pumps.

Blowout preventers installed . . . On July 22, 1957, 13⅜-in. o.d. casing was set at 3,086 ft. While waiting on cement, two 12-in. 900 QRCs and a 12-in. 900 Hydril were installed. Drilling proceeded on July 25, with 5-in.-o.d. Grade E drill pipe and nine 8-in. drill collars. Seven more 8-in. and three 9¾-in. drill collars were added to the string the next day. Bit size at this point was 12¼ in.

Intermediate string set . . . Drilling was uneventful to 11,505 ft., where 9⅝-in. casing was set, because the Elk City region was well known. Mud program, bit selection, bit weights, etc., were generally according to accepted standards for that area.

Turbodrill tested . . . With the bottom of the hole just below 5,300 ft. a Dresser Industries T12M3 turbodrill was put on test. In all, eight runs were made with the drill, alternating with conventional rotary runs so that comparisons could be made.

Purpose of the tests was to evaluate the turbodrill in shale and granite-wash formations, and to investigate the effectiveness of Y-slot watercourses in the bit.

An economic comparison of the turbodrill and the rotary was not made because of the many variables involved. However, H&P officials seemed to be enthusiastic over the performance of the new tool.

Best results were obtained when oil-emulsion mud was used. Bit life was up 37% and bit footage increased by almost 15% when a 7% oil-emulsion mud was used.

And more blowout preventers . . . After setting the 9⅝-in.-o.d. intermediate string, two 10-in. 1500 QRCs

and a 10-in. 1500 Hydril were installed and tested. The hole size was reduced to 8¾ in., the drill pipe reduced to 4½ in. o.d., and the drill-collar string changed to twenty—6½-in.-o.d. by 2¾-in.-i.d. collars. Mud was changed to lime base and both granular and flake lost—circulation materials were added.

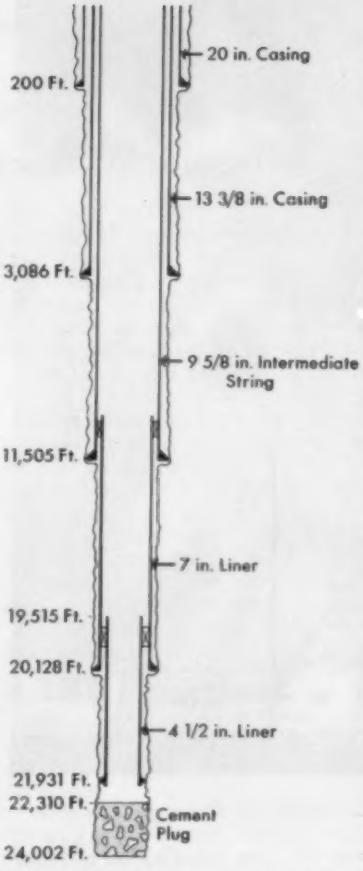
Trouble . . . The first trouble in the hole came at 11,715 ft. when circulation was lost with 12.4-lb. per gal. mud. This was on October 1, 1957, and the well was persistently plagued by lost circulation till a liner was set. All types of remedial action were tried with little or no success. The situation was further complicated by the mud starting to gas cut at around 12,800 ft.

Neither of these problems was cured, but the well was drilled deeper; accepting these hazards and learning to live with them. By trial and error it was found that the lost-circulation zones would support 13.4-lb. per gal. mud. It was hoped that time, filter cake, and cuttings would help seal off the thief zones and that mud weight could be increased. Although the mud weight was gradually increased to 13.8-lb. per gal., the gas was never controlled.

The gas was handled very carefully by Shell and H&P personnel. Short trips were made to feel out the gas potential. Time out of the hole, for any reason, was held to a minimum. To handle the gas after trips, a new use for an old tool was devised. Normally trip gas would be bled off through the conventional choke manifold. Rather than take the time required to do this and also accept the back pressure that this would impose on the annulus, the flow nipple was reworked to take a Baash-Ross wrap-around blowout preventer, which meant that the well could be bled off through the flow line. Even on this 10¾-in. choke the well would blow from 35 to 40 minutes after every trip.

Mud condition good . . . The mud used to drill from 11,500 to 20,000 ft. performed well. The only serious trouble occurred at 16,600 ft. when the lime-base mud gelled in hole during logging and in the trip back in plugged the drill collars and stuck the pipe. While high-temperature gelatin is a known hazard, this came earlier than expected. After some modification by the Magcobar field engineers, this same mud carried the hole to past 20,000 ft., and through one fishing job, all with very little fill on bottom and excellent circulating properties.

The May 10 morning report gave the viscosity at 58 seconds. This is an unusually low viscosity for drilling shales with 8,500 ft. of open hole above the bit. Common practice just a few years ago in southern Oklahoma was to carry 300 + seconds viscosity for similar conditions.



CASING PROGRAM on 5 Rumberger features two liners below 10,000 ft. Hole was plugged back to 22,310 ft.

Mud logging used . . . Throughout most of the drilling, the drilling mud was logged by Caran Engineering Corp. More than 14,000 measurements were taken to determine the hydrocarbon content (methane through butane). No difficulty was encountered in analyzing the true formation gas even under the conditions of high background gas, trip gas, slow drilling, high pressures and temperatures, and complex hydrocarbon drilling fluid. An infrared methane cell and gas cromatograph were used in these mud-stream gas analyses.

Straight hole . . . One factor that contributed to the lack of hole trouble, sloughing, or caving was the relative straightness of the hole. At 20,000 ft. the total displacement was only 170 ft. from the well bore, which may qualify the 5 Rumberger down to that depth to be the "deepest-straightest" hole drilled. With the temperatures encountered, approximately 250° F., the directional-survey pictures presented some difficulty. With specially designed containers for the instruments the Sperry-Sun single-shot survey taken at 20,028 ft. is believed to be the deepest ever recorded.

High-strength drill-pipe . . . The drill-pipe string to drill an 8⅜-in. hole at 20,000 ft. was a problem in design and handling practice. At 20,069 ft. the string was made up as follows:

Twenty 6½-in.-o.d. by 2¾-in.-i.d. collars.

11,969 ft. of 4½-in.-o.d. 16.60-lb. per ft. Grade E.

5,040 ft. of 4½-in.-o.d. 16.60-lb. per ft. X-95.

2,430 ft. of 4½-in.-o.d. 16.60-lb. per ft. Blue Ribbon and vanadium.

The string weighed about 340,000 lb. coming off bottom and 320,000 lb. on the slips. The problem in handling this weight of drill-pipe is in the slip area. The high-tensile-strength steels used in the top 7,000 ft. of the string are, as a consequence of their strength, notch sensitive.

When it is considered that the entire string weight is supported by the very small area of the slips and that these slips hold by biting into the pipe, it is apparent that careful handling is required. In this well, particular attention was paid to keeping the slips, master bushings, and rotary table dimensionally exact. Also, the slips were set as gently as possible.

Liner planned . . . On May 12, 1958, the well had reached 20,128 ft. and it was decided to run a 7-in. liner. This liner would: (1) case off the troublesome gas, and (2) allow the mud system to be changed to the less-temperature-sensitive Black Magic Supermix. After 7 days of fighting lost circulation and gas-cut mud, the hole was in condition for the liner on May 20.

During this period a lot of planning went into the well. Liner design, running of the liner, and setting and cementing of the liner were all considered at length by Shell. Factors such as drill-string hydraulics, drill-string loading, drill-pipe protectors, bits, pumps capable of continuous circulation at 3,500-psi. overshot strengths and many other points were discussed in joint meetings between operator and contractor.

The 7-in. liner run was of the following design—from the top:

690 ft. of 32-lb. per ft. P110 extreme line.

3,310 ft. of 35-lb. per ft. P110 extreme line.

978 ft. of 38-lb. per ft. P110 LTC.

3,772 ft. of 38-lb. per ft. S95 Hydrill FJ.

Total: 8,750 ft.

In mud this liner would weigh about 250,000 lb. Since it was desired to have a running string with a minimum yield in tension at least 100,000 lb. above the combined weight of the running string and the liner, a string of 5-in.-o.d. 26.06-lb. per ft. P110 casing was brought in to run the liner. The liner was run to 20,128 ft. without incident, but the liner hanger failed. The liner was then cemented, hanging from the 5-in.-o.d. casing, with 1,600 sacks. After 72 hours, the running string was backed off from the liner hanger and pulled out. This was indeed fortunate since it was discovered on pulling out that cement had circulated up around the 5-in.-o.d. casing.

Blowout preventers changed . . . After setting the liner, the blowout preventers were changed to accommodate a combination drill-pipe string. From the bottom: 10-in. series 1500 QRC with 4½-in. rams, 10-in. series 1500 SS with 3½-in. and blind rams and a 10-in. series 1500 Hydril. The same 3-in. choke manifold assembly was used.

The drill string below the 7-in. liner was a combination of 4½-in.-o.d. and 3½-in.-o.d. From the top:

2,300 ft. of 4½-in.-o.d. 16.6-lb. per ft. Blue Ribbon plus vanadium.

5,000 ft. of 4½-in.-o.d. 16.6-lb. per ft. X-95.

3,800 ft. of 4½-in.-o.d. 16.6-lb. per ft. Grade E.

Remainder, 3½-in.-o.d. 13.3-lb. per ft. Grade E with 4⅛-in.-o.d. 2⅞-in.-i.d., IF tool joints and twenty-six 4¼-in.-o.d. by 2-in.-i.d. drill collars.

Drill pipe pampered . . . In drilling the 5⅞-in. hole below the 7-in. liner, a great deal was learned about the handling of deep-hole drill strings. In this section of the hole, the 4½-in.-o.d. high-tensile drill pipe was handled with double elevators instead of slips. This system incorporates a rotating elevator support table, a stationary elevator support table, and two side-door elevators fixed so they could be quickly detached from the links. After a familiarization period, this system added only about 10 seconds per stand to the handling of the high-tensile pipe. This small loss was considered acceptable since rejections due to slip-area damage were practically eliminated.

Twistoff . . . Another problem met in the drill string was the failure of the 2⅞-in. IF pins on the 3½-in. drill pipe. A total of three pins broke while drilling, resulting in three fishing jobs, with the second and third fish in the hole at the same time. The successful completion of these fishing jobs was probably due to the excellent condition of the hole and the mud.

The cause of the pin failures is not yet clear. Although it was apparent that the pins were being stretched through being overtorqued, the nature of the torque is not fully understood.

Directional-survey trouble . . . The deepest reliable directional survey taken was at 20,120 ft. Beyond that, the film was blackened by heat.

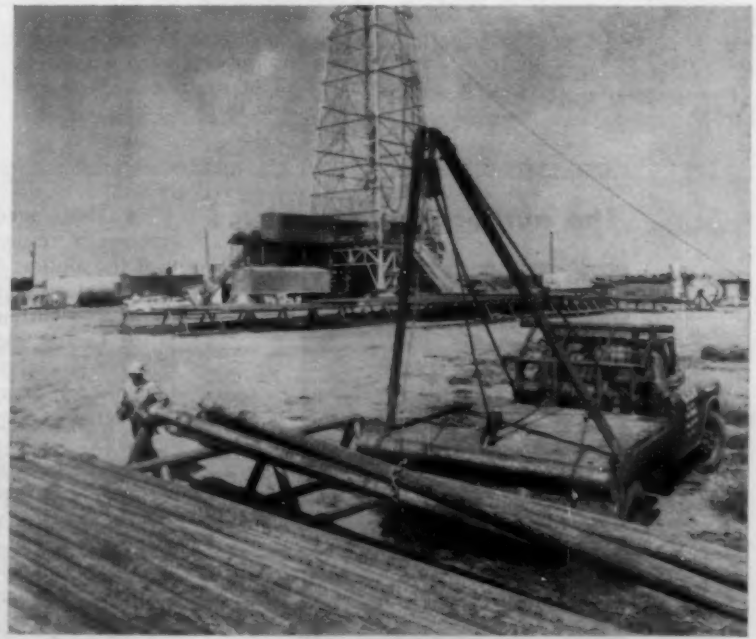
The most significant feature of the drilling from 20,128 ft. to total depth was the use of solid diamond bits. Although diamond bits have been used successfully in drilling hard formation, their ability to drill shale or alternating shale and sand was unproven. A total of 34 diamond bits was used in drilling 3,703 ft. Considering the bit cost, bit salvage, rig cost, and particularly trip time, the use of diamond bits was completely successful in drilling alternating sand and hard shale. The average footage per diamond bit was 116½ ft. Average time on bottom was 64 hours. The longest run was 392 ft. in 176½ hours (over a week).

Design of the diamond bits was frequently changed to improve performance. The most important development involved a change in concept—directing the mud flow across the entire face of the bit instead of through water courses. The straight groove "core spitter" was successful in preventing coring of the bit itself.

After drilling to 23,952 ft. the bit was pulled to core. Two 25-ft. cores were taken and the total depth of 24,002 ft. was reached on October 19, 1958. After logging and conditioning the hole, a cement plug was set with top at 22,310 ft. A 4½-in.-o.d. 15.1-lb. per ft. P105 liner was then run with the top at 19,515 ft. and bottom at 21,931 ft. The liner was successfully hung, cemented, released, and the packer set. The cement used, designed for maximum pumpability at high temperatures, was a combination of Trinity Inferno, Silica flour, CMHEC, and barytes.

The drilling-in string was a combination of 2⅞-in.-o.d. 10.4-lb. per ft. P105 with 2⅞-in. IF tool joints and 2⅜-in.-o.d. flush joint P110 tubing. Although the 816-P pumps with 4½-in. liners were adequate for drilling to 24,000 ft., a circulating pressure in excess of 4,000 psi. required the installation of a Gardner-Denver PL76 plunger pump with 3½-in. plungers. Instead of a conventional bit a specially designed Securalloy mill was used to drill out the cement, float collar, and float shoe.

The well is now being tested for completion. With a packer set at 19,350 ft., sands below the 4½-in. liner are currently being evaluated.



DESIGN of the drill-pipe string was changed several times to satisfy the various drilling requirements as depth increased.

OIL'S WORKING INVENTORY

Let's stop selling U. S. reserves short

"Even a cursory survey with little allowance for improvements in recovery techniques makes it possible to forecast within the next 20 years minimum additional supplies of about 70 billion barrels of crude oil alone from known fields and acreage already under lease. . . . The public can be reasonably sure that the U. S. will not soon experience a shortage of petroleum."

BY MORGAN J. DAVIS, president Humble Oil & Refining Co.

AS OUR domestic oil industry nears its centennial, some powerful voices are being raised in what sounds suspiciously like the premature preparation of an obituary. This is nothing new. The same cry that we are running out of oil has been raised many times before. It is surprising, however, that the note of alarm should be sounded at this time when domestic production is restricted so far below capacity by lack of markets.

The concern expressed as to a prospective shortage of oil has a hollow ring to domestic producers, particularly those in Texas. In Texas, most wells have been restricted to 12 producing days or fewer since October 1957, and there seems to be little prospect of returning to 15 days or more for some years except as the result of some unforeseen emergency abroad. In these circumstances, it is not surprising that many domestic producers should wonder if the alarm about future supplies contains elements of propaganda.

Paper presented at API annual meeting, Chicago.

Domestic oil is the nation's principal fuel, exceeding coal in importance by a substantial margin. Natural gas is also a major source of energy which may soon displace coal in second position. All of us have a direct and vital interest in an accurate appraisal of our future prospects for these fuels. The American public has a right, therefore, to expect the leaders of the petroleum industry to provide the most accurate and nonpartisan analysis that can be made of current and future availability of domestic petroleum supplies.

Changing conditions . . . An evaluation of our future domestic discovery and production of oil and gas is not an easy task. Past prophecies have consistently underestimated the availability of domestic oil and gas.

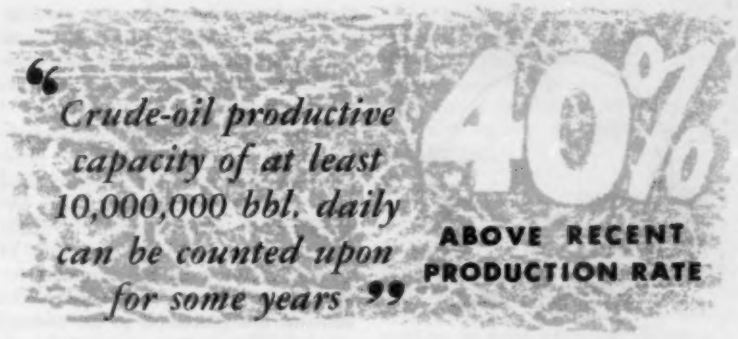
In retrospect, it is clear that the pessimists about domestic petroleum supplies have made their major error

The author summarizes . . .

- The United States is not poor in petroleum reserves or resources. Reserves of oil and gas are near the all-time high. We have an adequate working inventory in terms of current requirements.
- The current reserve availability of crude oil in the United States is large—more than 3,000,000 bbl. per day above present production and is sustainable for many years if the industry continues an aggressive program of exploration and development.
- We have a sound basis for reasonable optimism that discoveries and reserves of petroleum can keep pace with increasing domestic requirements for a long period. In the next 20 years, with little allowance for increased recovery due to improved techniques, we can add a minimum of 70 billion barrels of supply, above the 30 billion barrels of crude oil now estimated.
- The reasonable cost of domestic oil and gas,

in assuming that current conditions would continue indefinitely into the future. Such an assumption is as unwarranted today as it was in the past. History shows that ours is a highly dynamic industry—one with continuously changing conditions.

As pointed out recently by Thomas B. Nolan, director of the USGS, the petroleum industry is one of the best examples of the effectiveness of science and technology, and he comments on "the dangers of projecting current trends into what we can be sure will be the changed world of tomorrow."[1] If we are to make an intelligent appraisal of the future we must deal with the dynamics of domestic petroleum supplies with particular reference to the probable impact of technology both on oil currently available and on that still to be discovered.


"Crude-oil productive capacity of at least 10,000,000 bbl. daily can be counted upon for some years"
40%
ABOVE RECENT PRODUCTION RATE

Current Availability

The first question of immediate public interest is the current availability of petroleum supplies. This question has been asked of the National Petroleum Council several times since 1947, and resulting studies have consistently shown availability from domestic wells increasing at a faster rate than domestic demand. The council's latest report showed an ability to produce 9,867,000 bbl. of crude oil daily as of January 1957.[2] By contrast, the production of crude oil in 1958 will probably average less than 6,800,000, indicating a reserve producibility of not less than 3,000,000 bbl. daily.

Furthermore, the council reported that this producibility could be sustained with the drilling of 41,000 to 50,000 wells annually. Since the rate of well completions has been toward the upper end of this range and production has been far below estimated availability, it seems safe to say that current availability is at least 10,000,000 bbl. daily compared with estimated production in October 1958 of about 7,000,000.

It is surprising that representatives of some companies have questioned the official estimates of the council notwithstanding the fact that their own engineers have participated in these studies.

For the most part, criticism of the NPC estimates of capacity seems to result from the fact that since 1948 availability has greatly outstripped production. Thus, there has been no opportunity to demonstrate that the reported producibility could in fact be achieved or, if called upon, could be sustained for any length of time. Skeptics also point to the fact that the reported total producibility constitutes a higher percentage of proved reserves than the relationship existing in 1948.

At first glance, these ideas seem to have a plausible basis. Unfortunately, however, they reveal a lack of understanding of the conditions that govern producibility and of the methods by which it is determined. An article appearing in the November issue of Fortune Magazine is one of the latest to misinterpret the available facts.[3]

More fields . . . The producibility reported by NPC is not a guess. It is a figure resulting from competent engineering studies of individual wells and fields by trained specialists. Conditions have changed since 1948. We have today roughly twice as many producing fields in the U. S. containing in the aggregate 40% more reserves and over 100,000 more wells. These new fields and wells have their own individual capabilities, in no way related to those of previously existing fields. They have contributed materially to the present productive capacity.

Perhaps the greatest of all changes since 1948 is the advance in technological developments. The various factors that have increased the rate at which estimated proved reserves can be produced efficiently were set forth in some detail in the 1957 report on productive capacity by the

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compared with other sources of energy, can be maintained so long as the industry continues its technological progress and is assisted by regulatory agencies to be as efficient as it knows how to be.

- It is absolutely necessary to consider the dynamic nature of the petroleum industry in an appraisal of the future of domestic supplies of oil and gas. In my judgment, the past is only a prologue to what still remains to be accomplished.
- The prospects for the domestic petroleum industry could be changed drastically, however, by unwise actions by state regulatory agencies, the federal Government, or the industry itself, on such matters as conservation, percentage depletion, and import policy. It has taken a long time to build the present vigor of the domestic petroleum industry, and such vigor, once impaired, cannot quickly be restored.
- It is not in the best interest of our nation or of this industry to underrate either its past achievements or its capacity for future progress. On the contrary, I consider it our duty as citizens and as suppliers of petroleum to present to the American public the clearest picture possible of present and future domestic oil supplies. On that score, it is difficult to see how there could be important differences among us once we have examined the same evidence.

The record speaks far more eloquently than I can on the remarkable achievements of our industry. It can only hint, however, at the important technological developments on the threshold of realization. If we can only capitalize on the opportunities ahead, the dynamic tradition of our industry will continue to prevail and our domestic petroleum supplies will contribute to our economic welfare and to our national security for generations to come.

"Some estimates of ultimate U.S. oil production represent no more than a glance into a crystal ball"

NPC. They include: (1) multiple completion of wells; (2) hydraulic fracturing of producing formations; and (3) water floods, pressure-maintenance projects, and other recognized means of stimulating or maintaining producing rates.

The effect of these factors was illustrated in part by the fact that District 3 proved in March 1957 that it could produce at a higher relation to reserves than in 1948 even though prorated wells in Texas were restricted to 18 producing days.

A dramatic example of the type of development that has affected availability is a field in West Texas which is operating with water flood and exempt from shutdown days. North Ward-Estes produced an average of nearly 28,000 bbl. daily in 1957—equivalent to an annual rate of production of 14.4% of its estimated reserves of 71,000,000 bbl. at the end of the year.

By contrast, in 1948, its production of 10,600 bbl. daily prior to water flood was equivalent to 7% of the reserves estimated at that time, or less than one-half of the demonstrated rate of production in 1958.[4]

High productive capacity . . . A study of individual fields operating efficiently with modern producing practices supports the conclusion that crude-oil productive capacity of at least 10,000,000 bbl. daily can be counted upon for some years. Since this is more than 40% above the recent rate of production, it is reasonable to believe that the domestic industry can keep pace with the growth of domestic demand for the foreseeable future unless exploration and drilling are curtailed drastically. Continuation of present percentage depletion is a basic need for this result.

These conclusions are particularly significant in the light of the prospects that domestic petroleum demand may increase in the future at an average rate of only 3% annually, about the same as the long-term rate of growth in domestic requirements for all forms of energy. While petroleum demand has increased at an average rate of 5% per year over a long period, that rate was possible only while oil was increasing its participation in total energy requirements.

This rate of increase cannot continue if coal holds the markets it now has in which it has a price advantage and if gas continues to be an increasingly effective competitor for residential and industrial heating.

Future Petroleum Discoveries

The second important question about our industry is the adequacy of future domestic supplies. This subject is one that the public will always find difficult to understand because the figures on proved reserves commonly heard leave the impression that our known domestic petroleum resources will be exhausted within a relatively short period of years. This is particularly disturbing to people outside of the industry and is contrasted with the common belief that coal reserves are sufficient to last a thousand years.

References to coal reserves, however, are usually based not on supplies to be produced by present mines but on estimated "commercial" reserves in place. By contrast, the petroleum industry goes to the other extreme in speaking of its estimated known reserves. Official estimates of the American Petroleum Institute, ably prepared by the Committee on Petroleum Reserves, are restricted to "proved" reserves.

These are reserves recoverable at present prices and with presently known technology through wells and facilities in operation although, technically, the estimates include a small increment of undrilled proved reserves. Furthermore, ground rules do not allow the estimation of the effect on a field of secondary recovery and pressure maintenance by fluid injection until the facilities are installed and results demonstrated. As a result, estimated reserves probably average only about one-third or less of the oil in place in fields already discovered.

It is clear, therefore, that our official reports on reserves provide the public with a bare minimum estimate of oil economically recoverable through existing facilities. Those of us who have worked on reserves estimates, know from experience that the actual production from known fields will exceed the presently reported estimates by a substantial margin.

New basis? . . . The policy of preparing reserves estimates on the present basis was initiated 22 years ago at a time when the nation's chief concern was to keep books on its inventories of recoverable petroleum rather than to estimate **rates** at which oil could be supplied. The Reserves Committee has done a good job, but there is now a question in the minds of some industry people as to whether this type of estimate, by itself, best serves the public interest since, unfortunately, there seems to be a growing tendency both inside and outside industry to use it as a basis for deciding whether domestic supplies are adequate to meet future needs. This use, of course, has neither been encouraged nor condoned by the Committee on Petroleum Reserves.

If the oil industry were to adopt the methods commonly applied in estimating coal reserves, it, too, could speak of vast potential resources that make our known reserves look insignificant. Many of you are familiar with a recent book by Bruce C. Netschert, a member of the staff of Resources for the Future, which stated that there may be 500 billion barrels of crude oil potentially available for future recovery in the United States.[5]

This theoretical concept of a "resource base" to which "the industry can apply its ingenuity and science" serves at least to emphasize the inadequacy of reserves estimates based on our traditional rules when used for the purpose of evaluating future supplies. Beyond Netschert's estimate, we could also add some 500 billion barrels of shale oil and arrive at potential liquid fuel supplies from domestic sources sufficient for hundreds of years.[6]

History warns us not to place too much confidence in our ability to predict the ultimate amount of oil production to be realized in the United States. Nevertheless, such estimates continue to be made, particularly in recent years. Some of these represent no more than a glance into a crystal ball. Others represent projections or calculations based on an extrapolation from the past, and a few constitute serious studies by geologists and other scientists.

Some years ago, Wallace Pratt, one of the nation's most distinguished geologists, estimated that 100 billion

barrels of oil would ultimately be produced in the United States.[7] At that time, his estimate was considered highly optimistic by most of his colleagues, but now his figures are regarded as entirely too low even by pessimists.

Texas prediction . . . Last spring, M. King Hubbert, another outstanding petroleum scientist, made a projection of future oil production in Texas on two bases.[8] Both methods gave an answer of about 60 billion barrels of total recoverable Texas oil with a peak of about 3,200,000 bbl. daily in 1962-1965, a rate which had already been exceeded in March 1957.

Apparently overlooked in this prediction was the already developed productive capacity in Texas, which has continued to grow to a level now estimated to exceed production by 2¼ million barrels daily. If these important considerations had been taken into account, Dr. Hubbert might have concluded that Texas production can continue to rise for 10 to 20 years, notwithstanding his very conservative estimate of ultimate Texas production.

The USGS concluded in 1956 that a total of 300 billion barrels as the ultimate reserves of the United States and of the adjoining continental shelves might be a reasonable figure considering significant improvements in recoverability that are now being accomplished or promised in the future.[9]

Unfortunately, all these widely varying estimates or guesses, however well-meaning they may be, leave confusion and even genuine concern in the minds of those unable to evaluate them. Probably in no other field have so many intelligent prophets been confounded. Beginning with the early days of the petroleum industry, forecasts of shortage by otherwise knowledgeable people have come forth at frequent intervals only to fade away before the surprising progress of the industry.

The doubtful value of using estimates of ultimate production in planning for the future is shown by the 1956 estimate of Chase Manhattan Bank which plotted future crude-oil production in the United States on the assumption of an ultimate production of 165 billion barrels.[10] The next year, this same organization had accepted as plausible a **minimum** ultimate recovery of 250 billion barrels.[11] Within 1 year, the estimate was raised by more than 50%.

Where policy decisions in the public interest are concerned, we would seem to be far better advised to take a critical look at what we can see ahead within a reasonable period of 10 to 20 years. Beyond that, there will no doubt be many variables that are unpredictable now, such as other uses of petroleum and development of other forms of energy. One cannot refrain from speculating as to what volumes of whale oil forward-planning New England whalers in the year before the Drake well may have forecasted as the probable requirements for A.D. 1958!

API-AGA report . . . The American Petroleum Institute and the American Gas Association report estimated reserves at the beginning of 1958 of more than 30 billion barrels of crude oil, nearly 6 billion barrels of natural gas liquids, and almost 247 trillion cubic feet of natural gas. The crude-oil figures are approximately twice what they were 20 years ago, and close to the peak figure reported at the end of 1956.

Since estimated proved reserves have failed to increase much in recent years, some people have concluded that the industry can no longer find enough new oil to keep pace with growing domestic demands. This is not believed to be a correct conclusion. In 1958 production from domestic wells will be only 10% higher than in 1951, but number of wells and capacity to produce have increased far more rapidly.

Crude-oil production in 1957 was slightly more than 2½ billion barrels with estimated reserves at year end about 12 times production. Historically, however, the current relation of reserves to production is not a low one but, instead, is about the average the industry has carried during the past 20 years. In 1937, the estimated proved reserves of 13 billion barrels at the beginning of the year were only 10 times production that year; in 1948, they were less than 11 times production.

In 1958, therefore, we are better off in terms of the relation of reserves to production than we were either 10 years ago, when the industry was worried about a shortage of immediate supplies, or 20 years ago when the industry was worried about reserves being discovered too rapidly.

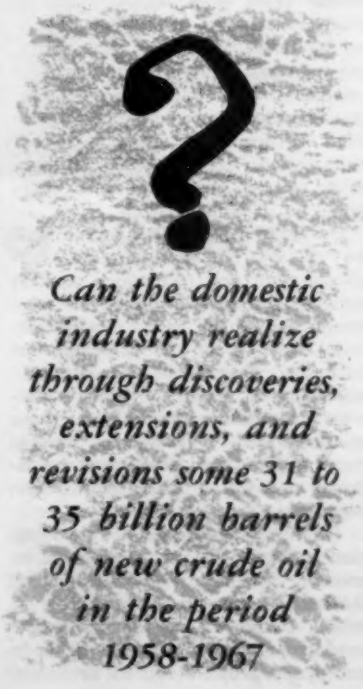
There is another way of looking at the relation of production to reserves that should help to dispel fears that the United States is running out of oil. At the beginning of 1938, the United States had estimated proved reserves of 15.5 billion barrels. In the next 10 years, crude-oil production exceeded 15 billion barrels. Yet, reserves were not exhausted but instead increased to 21.5 billion barrels at the beginning of 1948.

In the 10-year period ending with 1957, crude-oil production exceeded 22 billion barrels, or slightly more than the known reserves at the beginning. Once again, we find the paradox of producing all we said we had and ending up with more than ever before!

1958 reserves . . . Proved crude reserves at the beginning of this year exceeded 30 billion barrels. Judging by experience, it seems reasonable that the industry could, within the next 10 years, produce 30 billion barrels, or approximately the equivalent of its present proved reserves. In this case, demand would increase at a rate a little more than 3% annually, or a total of 40% above the 1958 level. We would then end the period with a production of about 3½ billion barrels for the year 1967.

If we assume that proved reserves equivalent to 9 or 10 times annual production in 1967 will support the required producibility at that time, then during the next decade we must add about 31 to 35 billion barrels of crude oil through discoveries, extensions, and revisions or approximately the same amount as was added during the past 10 years.

This estimate of new crude oil necessary for the next decade is considerably less than some recent forecasts which assume a 5% annual rate of increase in demand and that discoveries must be 1½ times production. The estimate of Chase Manhattan Bank that 57 billion barrels of addi-


?
Can the domestic industry realize through discoveries, extensions, and revisions some 31 to 35 billion barrels of new crude oil in the period 1958-1967

tional domestic crude oil would be necessary, if domestic production is to continue to supply 90% of the nation's oil needs, will probably prove to be incorrect for two reasons.

First, demand is more likely to increase at a rate of 3% rather than 5%, for reasons already stated; and second, improvements in reservoir management will permit reserves to be produced more rapidly.[12] These considerations require a rate of additions to oil reserves only slightly higher than that of the past 10 years.

The crucial issue, then, with respect to future domestic petroleum supply is this: Can the domestic industry realize through discoveries, extensions, and revisions some 31 to 35 billion barrels of new crude oil in the period 1958-1967?

The upper limit of this range exceeds the new oil added during the past 10 years only slightly. Since drilling is currently at about the average level for 1948-1957, it follows that the required goal can be reached with a level of activity that will not exceed the 1956 peak and, therefore, one that is easily attainable. The only circumstances that could alter this conclusion would be a continued decline in drilling or a sharp drop in new reserves developed per well.

Greater recoveries . . . Under the rules used by the Reserves Committee, the bulk of new oil credited in the next 10 years will continue to come from extensions and revisions, with new fields given relatively minor credit in the years immediately following discovery. In view of the large number of fields found in recent years, and revisions that will result from development and application of improved technology to these and older fields, prospects are quite good that estimates of recovery from known fields will be raised within 10 years by 20 to 25 billion barrels.

During this period, it is certain that we will also see some important applications of new techniques, such as enriched gas drive or similar reservoir treatment, which may substantially raise estimates of the percentage of oil in place that can be recovered economically. It is still too early to estimate quantitative effects but if those methods work only half as well in practice as in the laboratory, the industry will see surprising increases in recovery.

Finally, more orthodox fluid injection methods will be applied to an increasing number of old fields. Paul Torrey has estimated that at least 11 billion barrels of oil may be recovered from presently known fields by secondary projects still to be initiated.[13] During the next 10 years, several billion barrels from this source should be added to the estimates of recoverable crude oil. The sum of all these possibilities for improved recoveries from existing fields might even exceed production expected during the next decade.

Exploration activities . . . Our analysis leads finally to the probable results of exploration activities in locating new sources of supply. Here we must take into account the untested prospects already located as a result of past exploration and other possibilities on some 350 million undeveloped acres currently held under oil and gas leases, as well as the potential of acreage remaining to be leased in future years.[14]

A quick calculation provides the basis for optimism rather than pessimism about future discoveries. On the conservative assumption that only 2% of the 350 million acres of undeveloped leases will produce oil and that the average ultimate recovery per acre will be 5,000 bbl., the recoverable reserves from new fields on this acreage may ultimately exceed 35 billion barrels. There will also be much additional leasing of land and a number of discoveries on new acreage before 1968.

One hears quite often the view expressed that the large fields have already been found and that all we can find today are small fields with thin sands. Those familiar with exploration are aware, of course, that this supposition is not true. The fact is that the industry is continuing to find fields with substantial reserves at about the same rate as in former years. This statement is based on Humble studies of discovery frequency of fields with reserves of 10 million barrels or more. What has confused the picture is that concurrently with the finding of large fields, there has been an enormous increase in the number of small fields found in recent years.

The significance of this situation from the standpoint of future oil discoveries is that the increasing number of small fields has been **in addition to,** rather than **in lieu of,** large fields. These small fields thus represent an added source of supply, a source made available largely through improved technology in both exploration and well completion.

Large fields . . . The continuing discovery of large fields is not confined to new provinces. Both old and new areas contribute. An example of a major field in an old producing area is Neches field in East Central Texas, discovered in 1953 after many dry holes had been drilled around it. Another example is the Headlee-Dora Roberts area in West Texas, discovered in 1953-1955.

New provinces offer still more intriguing prospects. Offshore Louisiana includes several fields that can already be rated as major, and a number of others that will probably turn out to be quite large. In Utah there is a new major field, or group of fields, although the search there has barely begun. Unquestionably, Louisiana and the Four Corners area will be credited with substantial increases in reserves in 1958 and in years thereafter.

In California, there are known producing structures that still remain to be developed and produced from large offshore extensions. In addition, a number of large untested offshore structures have atttracted high bonus bids on the small portions so far offered for lease. In our newest state, Alaska, the commercial search for oil is just beginning, with prospects rated promising by many companies.

An analysis of the outlook for domestic oil discoveries leads to the conclusion that they will keep pace with national needs during the period under discussion. Even a cursory survey with little allowance for improvements in recovery techniques makes it possible to forecast within the next 20 years **minimum** additional supplies of about 70 billion barrels of crude oil alone from known fields and acreage already under lease. Since this is in addition to the present proved reserves of 36 billion barrels of petroleum liquids, the public can be reasonably sure that the United States will not soon experience a shortage of petroleum.

If our search for oil slows down, as at present, it is not due to a lack of new prospects but because there is a lessened incentive to continue an aggressive search in view of an already burdensome surplus producing capacity and an uncertain outlook as to future markets for domestic production. Our national policies for the foreseeable future of 10 to 20 years at least, and probably for longer, can, if we choose, be formulated on the basis that domestic sources can continue to supply the same proportions of total demand that they have in recent years.

Adequate Supplies at Reasonable Prices

The final question that requires consideration is the ability of the domestic petroleum industry to meet increasing requirements at reasonable prices. A survey of past economic data, which need not be detailed here, shows that petroleum has been reasonably priced to date despite deeper

drilling, rising costs of materials and labor, and other factors that have alarmed us about future costs.

Two principal errors account for much of the misconception about the rate of increase in the cost of domestic crude oil in recent years. The first is the tendency to overlook the effect of improved technology in offsetting inflation. The other error lies in the implicit assumption that all exploration, drilling, and producing expenditures are related to crude oil only.

Needless to say, industry finding and producing costs must be related not only to crude oil but also to natural-gas liquids and natural gas notwithstanding the difficulties involved in the allocation of such costs.

Several other considerations concerning costs deserve brief mention. First, all unit costs are adversely affected by severe restriction of production. At present because of limited markets, the domestic industry is producing only about 70% of maximum efficient capacity, and probably not more than 55% in Texas. Second, we have not been developing reserves as economically as we should.

Most of us know that reserves can be developed and produced efficiently in many fields with far fewer wells. With the cooperation of state regulatory agencies, the industry should make rapid progress toward more efficient spacing of wells. Finally, for reasons previously discussed, the application of improved recovery methods on a wider scale must raise ultimate yields beyond current reserve estimates with obviously favorable effects on costs.

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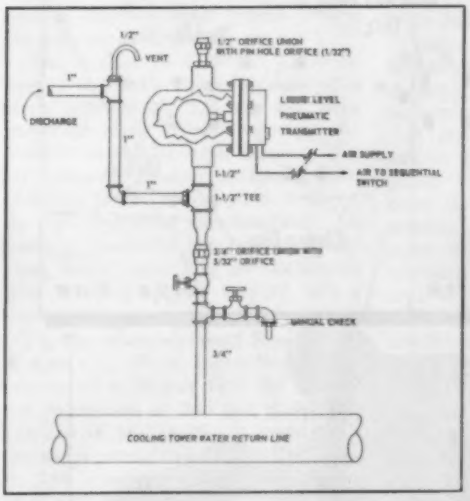
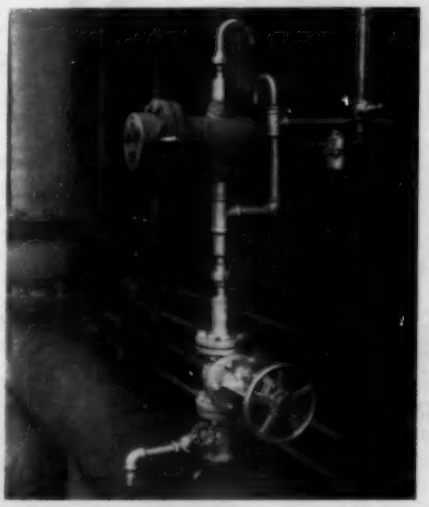




A Coin-Your-Ideas winning suggestion

Gas alarm for cooling-water systems

A SIMPLE, low-cost instrument for detection of leakage of C_5 and lighter hydrocarbons or other light gases into cooling water systems has been developed and used extensively by the Baton Rouge refinery of Esso Standard Oil Co. The instrument consists of a ball-float type liquid-level pneumatic transmitter, a sequential pneumatic-electric switch, and attendant piping.

A small continuous sample of water is taken from the top of the cooling tower water return main and passed through a 5/32-in. orifice into the bottom of the float chamber of a liquid-level transmitter. A vented seal line is arranged to maintain a constant high level in the float chamber and to serve as a water discard line. A capillary bleed from the top of the float chamber is provided to vent small quantities of dissolved air or other gases that normally may be present in the water.

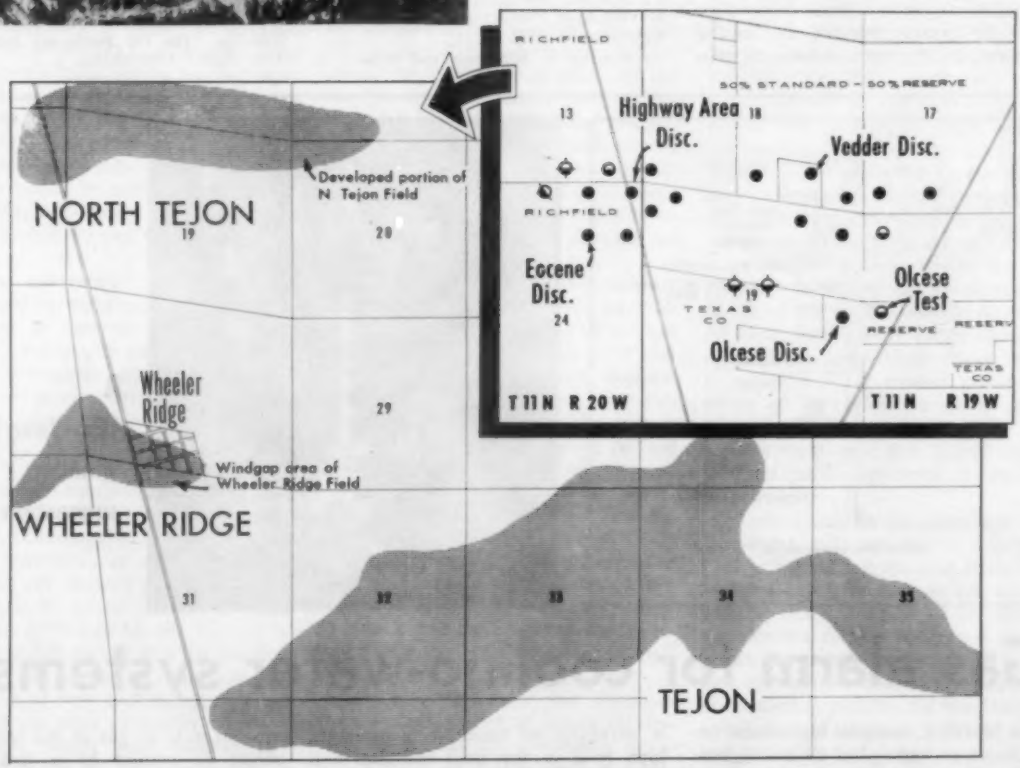
If vapors enter the float chamber at a rate greater than the capacity of the event, the water level of the float chamber falls with an accompanying change in the output air pressure of the instrument. This change actuates a pneumatic-electric sequential switch located in the control room and tied into an existing alarm system. Thus, any increase in gas in the sample, as might be caused by a leaking exchanger, will actuate the alarm.

Qualitative operability tests in which air was injected into the water mains showed a response time in 5 minutes. In actual practice the alarms have given early warning of many leaks in heat exchangers at the refinery. Esso has a patent application pending for the instrument. The device was designed as a result of a suggestion submitted by R. E. Nelson, Jr., through Esso's Coin-Your-Ideas suggestion system. Nelson is instrument technician in the mechanical division of Esso's Baton Rouge plant.

Speedy drilling in volcanics

. . . Operators in California's new North Tejon field find control of mud weight and use of high circulating rates result in less time spent in highly fractured basaltic section.

BY D. H. STORMONT
District Editor



PRODUCTIVE LIMITS of North Tejon field (see inset for well detail) have been defined only on the west flank. The field will probably prove to be one of California's most important discoveries in recent years. The rig shown at top is typical of those used at North Tejon. It is assembled so that about half of its 1,300 hp. can be applied to the mud pump.

DEVELOPING deep oil sands at North Tejon field, on the southern rim of San Joaquin Valley, California, is an expensive, relatively slow undertaking. But it is not the task it once was, as operators now know how to cope with a serious pipe-sticking problem.

First wells in the year-old field required more than 100 days to reach total depths of about 12,000 ft. Some 30 days were spent in drilling through the basalt section just overlying the pay zone. Wells now are completed in approximately 90 days, with most drilling through the volcanic section requiring about 20 days.

The difficult drilling is not due to the hardness of the basalt. When the bit is in solid material, drilling rates are only slightly slower than in the hard sands and shales which overlie the basalt. It's the basaltic detritus zones—sections where the volcanic deposits are so unconsolidated that sloughing occurs—which cause the trouble.

The section is present over much of the Tejon embayment area. For years it tended to deter deeper drill-

A given well may produce from one up to six sands

ing. It is found in all deeper North Tejon wells completed to date, but the greatest thickness is found in wells near the discovery. From a 1,200 to 1,800-ft. section in that area, it thins to 50 ft. or less at wells in the western portion of the field (see map).

Important discovery . . . North Tejon promises to be one of the most important new field discoveries in California in recent years. The initial discovery was in Vedder sands of lower Miocene. Existence of several other pays points to sizable new oil reserves.

The Vedder development is only about 2 miles northwest of the Tejon-Grapevine field. There the JV sand (lower middle Miocene) is productive at depths of 6,600 to 7,400 ft. The Olcese (middle Miocene) produces at about 5,800 ft. and four other sands are found at shallower depths. The Vedder has not been found productive in the few wells which drilled through the basalt in this area.

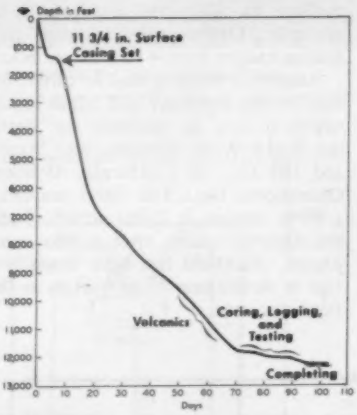
The Vedder is 2,000 to 4,000 ft. deeper at North Tejon because of a steep regional dip. If the dip were projected from Tejon-Grapevine, the Vedder would be even deeper. But an east-west-trending anticlinal fold, plunging to the northeast, is believed to exist and form the structure. An updip permeability barrier is the principal factor controlling oil accumulation. Faulting appears to play only a minor role.

. . . The discovery well, Reserve Oil & Gas Co. 67-18 Butler-Wehr, was completed in March 1957 for an initial production of 245 bbl. daily. Located in SE 18-11n-19w, it found Vedder sands productive at 11,850-12,207 ft. The overlying basalt was topped at 10,430 ft.

Subsequent drilling around the discovery, now called the Main area, has resulted in six other Vedder producers. Six productive sands have been found in the top 800 ft. of Vedder, which is well over 1,000 ft. thick in this area. Depending upon structural position and permeability, a given well thus may produce from a single sand or as many as six.

. . . The Highway area, about 1 mile west of the discovery, was opened last April when Richfield Oil Corp. completed 81-24 KCL-I in NE NE 24-11n-20w. The upper Vedder sands produced in the Main area were found at 9,165-9,557 ft., some 2,500 ft. structurally higher. Four other Vedder producers have been added there, plus a discovery in the deeper Eocene.

Development has narrowed the distance between the two areas to about ½ mile. A fault may exist somewhere in the undrilled area. However, all indications are that oil production will be continuous.



DRILLING TIME curve for a recent 12,250-ft. well in the Main area. As the slope of the curve shows, drilling rate through the volcanic section was substantially the same as that in other formations below 7,000 ft.

A pool 2 miles or more in length and as much as 1 mile wide is anticipated. Western limits apparently have been delineated, but the northern, eastern, and southern limits are still open. Olcese production has been established ½ mile south of the Main-area Vedder discovery. But since this sand is above the basalt it is not considered here. Likewise, because of the thin basalt section found in Highway wells, this area also is excluded.

Drilling program . . . Hole-size program followed by Reserve in the Main area starts with a 17½-in. hole to about 1,350 ft., where 11¾-in. surface pipe is set. A 10⅝-in. hole is then drilled through the basalt, which in a typical well would be to a depth of about 11,200 ft.

Hole size is reduced to 9⅞ in. until testing is started. Then it is reduced to 8½ in. To complete the Vedder producers, 7-in. casing is set on top of the pay, and a 5½-in. flush-joint liner through some 400 to 700 ft. of producing zone. Average total depth is about 12,000 ft.

Purpose of the extra-size hole through the basalt is to reduce the danger of drill-pipe sticking. Most of the volcanic section is well consolidated, and though fractured, stands up well. Where weathering has occurred and large quantities of bentonitic material are present, sloughing occurs. The larger size hole tends to minimize pressure surges created when the drill pipe is pulled or run.

. . . Drilling-mud program followed is to use a clay-base mud to a depth of about 8,500 ft., or to the top of the basalt. At that point the mud is emulsified, using 8 to 10% of diesel oil or crude oil. General properties of the mud used in a typical well are shown in Table 1.

As is shown in the table, a heavy, viscous mud is used once the volcanic section is entered. Mud weight is never permitted to drop below 90 lb. per cu. ft. If this occurs, experience has shown there is not sufficient hydraulic pressure to keep sections of basaltic detritus from sloughing into the hole. Mud viscosities are kept high (80 to 100 seconds) in order to keep the relatively heavy fragments of basalt suspended in the mud.

. . . Precautions taken in drilling through the volcanics section, in addition to those already discussed, include the following:

1. No surveys are made for fear that pipe will become stuck during the drilling halt.

2. High rising velocities are used. Based on a 90% pump efficiency, mud velocities of approximately 125 ft. per minute, are used during drilling of the 10⅝-in. hole.

3. To provide maximum volume of mud at the bit, full-opening bits are used. The course or jet is completely cut out to provide an opening of about 1¼ in.

Mud pumps used vary in size, but generally they are about 750 hp. Most are equipped with 16-in. cylinders. In drilling the volcanics section, discharge pressures of about 1,450 to 1,750 psi. are used.

Because of better mud control and experienced drilling technique, stuck pipe is no longer the problem it was in the Main area. A fishing job caused by stuck pipe seldom occurs now; whereas, in earlier wells pipe was stuck two or three times.

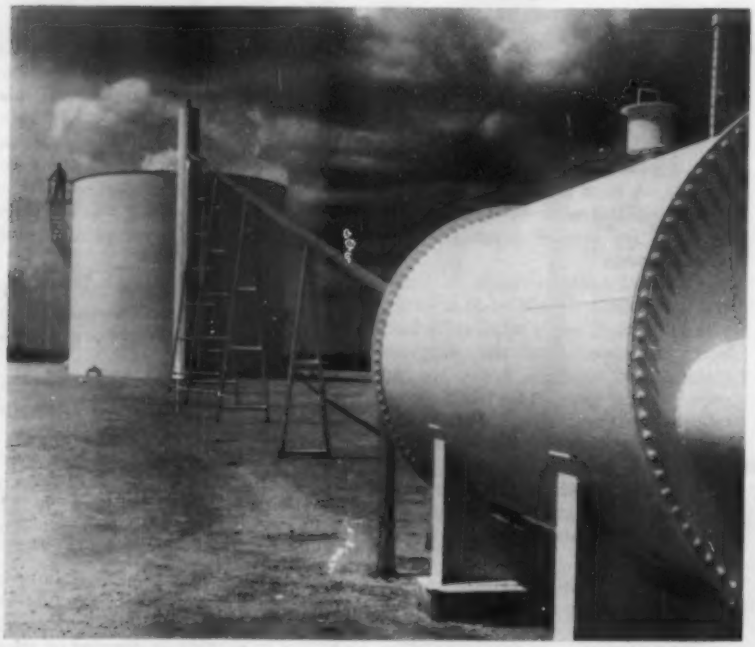
TABLE 1—MUD PROGRAM FOR TYPICAL NORTH TEJON VEDDER WELL

Depth—	Weight lb./cu. ft.	Viscosity, sec.	Water loss, cc.
Suface to 6,500 ft.	68-80	45-60	7-8
6,500 to 8,500	72-80	45-60	6-7
8,500 to basalt	76-80	45-60	4-5
Basalt to TD	90-92	80-100	3-4

How this freedom from stuck pipe is paying dividends is reflected in the drilling-time curve of a recent completion in the Main area. As is indicated in the plot, only 17 days were required to drill through a 1,400-ft. volcanic section. Total depth of about 12,250 ft. was reached in 93 days, after spending almost 16 days in coring, logging, and testing Vedder oil sands. The well was drilled about 12 days faster than those completed a year ago, with nearly all of the savings coming from faster penetration through the volcanic section.

Because drilling is relatively hard from top to bottom, 90 days is still regarded as a good completion time. Average completed cost is about $300,000 per well. Bit consumption is high, from 110 to 135 per well. In drilling the volcanic section, the average bit will drill about 100 ft. of hole. Drilling rate through this section ranges from 4 to 9 ft. per hour.

Reserve is keeping two or three rigs busy in the Highway and Main areas, where it acts as operator for itself, the Butler-Wehr interests, and Standard Oil Co. of California, Western Operations, Inc. The latter acquired a 50% interest in 2,000 acres around the discovery soon after it was completed. Richfield has been using two rigs in developing its properties in the Highway area.



THIS 5,000-BBL GUN BARREL was recently erected in the Permian basin. Hot water from the heater in foreground is returned to the boot (beside tank) through the inclined, insulated pipe, by gas lift.

King-size gun barrel is believed one of biggest

THIS GIANT is used with two 3,000-bbl. stock tanks to serve an entire field in Andrews County, Texas. It is 30 ft. high, almost 35 ft. in diameter, and has a cone bottom. With a heating system, the gun barrel was designed to treat 7,000 bbl. per day with a 17-hour retention time for all well fluids in the treating tank. It was welded from ¼ and ⅜-in. mild-steel plate, has a 36-in. diameter by 38-ft.-high outside boot, and has a capacity of 5,000 bbl.

The gun barrel is heated with a 2,000,000-B.t.u. per hour capacity indirect heater equipped with 4-in. cast-iron coils located approximately 150 ft. from the gun barrel. Water is circulated at a rate of approximately 65,000 lb. per hour from the bottom of the gun barrel, through the heating coils, to the outside boot. The return of the hot water from the heater to the boot rather than to the gun barrel proper is an important feature of this treating system. This hot water mixes thoroughly with the incoming well fluids to heat the oil to the treating temperature more rapidly than if the oil were passed through the hot-water section of the gun barrel. Water circulation is obtained by means of a gas-lift system in the water-return line. Gas consumption is about 1 M.c.f. per hour. This treating system was designed to hold the gun barrel at between 90° and 100° F. during the most adverse weather conditions anticipated. In tests during average weather conditions, the gun barrel temperature was held at over 100° F. indefinitely with only 130° F. water-bath temperature in the indirect heater. Calculations indicate the gun barrel may be held at over 110° F. during the most adverse weather conditions by adding a second 2-million B.t.u. per hour indirect heater.

The system has these advantages:

1. Low initial cost.
2. Suitable for use with well fluids.
3. Eliminates calcium sulfate scale that would form on a direct-heater surface.
4. Tubes of indirect heater easily cleaned. Shut-down not necessary.

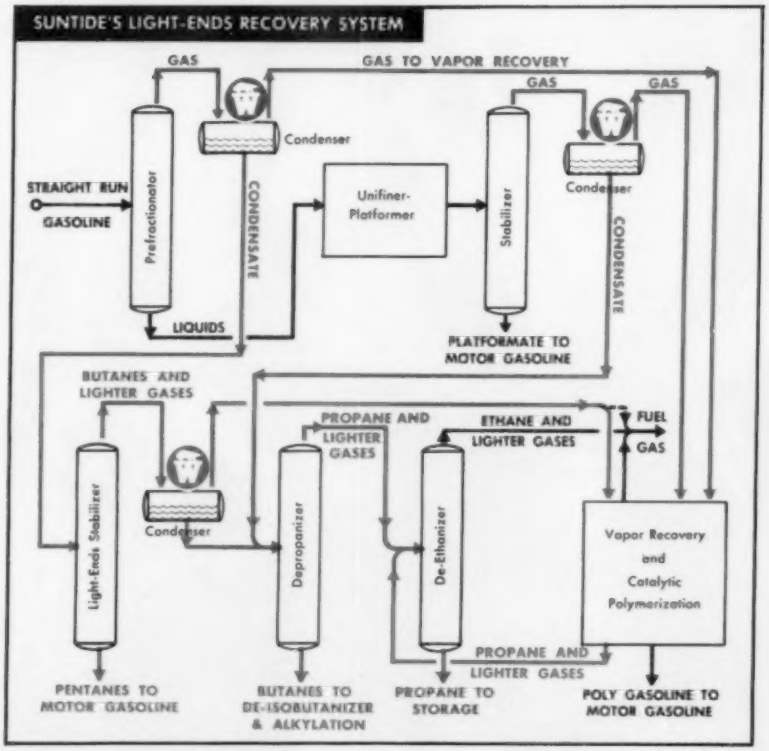
Another feature of this gun barrel is the interface float for controlling the oil-water interface. This float is plastic coated to prevent scaling and corrosion. It operates a mechanical pilot which operates a 4-in. motor valve to dump the water. This has proved to be extremely dependable, since the interface will not vary due to changes in gravity of well fluids or the level of the oil within the gun barrel.

Since the well fluids handled by this battery are very corrosive, a number of corrosion-prevention materials were used to protect the equipment. The well fluids enter the gun barrel from the outside boot through a cross-type slotted spreader fabricated from Transite pipe. Also, the cone bottom of the gun barrel is equipped with a Transite siphon drain. Seven 3-in. diameter by 60-in.-long graphite anodes connected to an external rectifier were installed for protection of the salt water section. The boot was coated completely with a coal tar-epoxy.

The unit was designed and erected by Sivalls Tank Co., Odessa, Tex.

WOLVERINE
TUBE
Items of Interest to the Processing Industry

PUBLISHED BY WOLVERINE TUBE



Payout in less than a year

SUNTIDE BOOSTS LIGHT ENDS RECOVERY

BY ERNEST DODD

Because of its ability to increase the throughput of existing heat exchangers and condensers, Wolverine Trufin® Type S/T—the integrally finned tube—was used to tube many exchangers in Suntide Refining Company's new light-ends-recovery system installed recently at Corpus Christi, Texas. Suntide is an affiliate of Sunray Mid-Continent Oil Co.

To reduce installation costs, Suntide designed its new light-ends-recovery system so that it would take full advantage of existing facilities and equipment. Because of the increased efficiency achieved in recovery of light ends, Suntide expects payout to occur in less than a year.

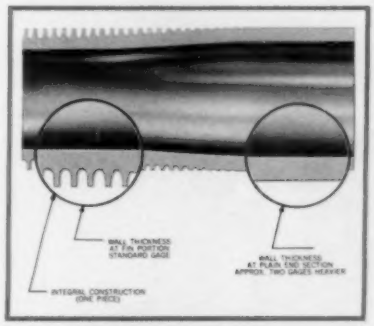
Installations such as this are made to order for Wolverine Trufin Type S/T. Since it is an extended surface tube, with fins extruded directly from the tube wall, Trufin Type S/T has approximately 2½ times more surface area than plain tube. Because of this it is possible to pack more heat transfer surface into a given area—thus stepping up the capacity of existing equipment.

Also of major importance is the fact that Trufin Type S/T is interchangeable in shell and tube heat exchangers and condensers with the prime surface tube it was designed to replace. In fact only standard tools and retubing techniques are required.

Wolverine Trufin Type S/T is available in a wide range of sizes in copper and copper alloys, aluminum and steel. Next time you consider heat exchanger tube specify Wolverine Trufin Type S/T —realize the increased heat transfer performance this integrally finned tube makes possible. Write for complete information.

WOLVERINE TRUFIN® TYPE S/T IS ENGINEERED FOR THE JOB

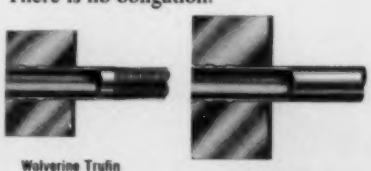
Wolverine Trufin Type S/T is specifically engineered for use in shell and tube heat exchangers and condensers. The cutaway illustration, below, graphically shows its unique, one-piece construction. Because of this, Trufin Type S/T gives constant performance over a longer period of time. Fins are unaffected by vibration, thermal shock or pressure variations.


WALL THICKNESS AT FIN PORTION STANDARD GAGE
WALL THICKNESS AT PLAIN END SECTION APPROX. TWO GAGES HEAVIER
INTEGRAL CONSTRUCTION (ONE PIECE)

EASY TO INSTALL

Here's proof (in the drawings below) that Trufin Type S/T rolls into headers as easily as does plain tube. Standard rolling-in methods only are necessary —there is no deviation from existing fabrication procedures.

Wolverine Trufin Type S/T is the original, integrally finned condenser tube. It was developed and pioneered by Wolverine Tube. Over the years Wolverine Tube has compiled a great deal of heat transfer information—particularly in the field of finned tube applications. If you have a problem — don't hesitate — ask for the assistance of a Wolverine Field Service Engineer. There is no obligation.



Wolverine Trufin Type S/T Condenser Tubing

Prime Surface Condenser Tubing

prefabricated to your specifications and shipped in exact installation order

save space and reduce inventory problems

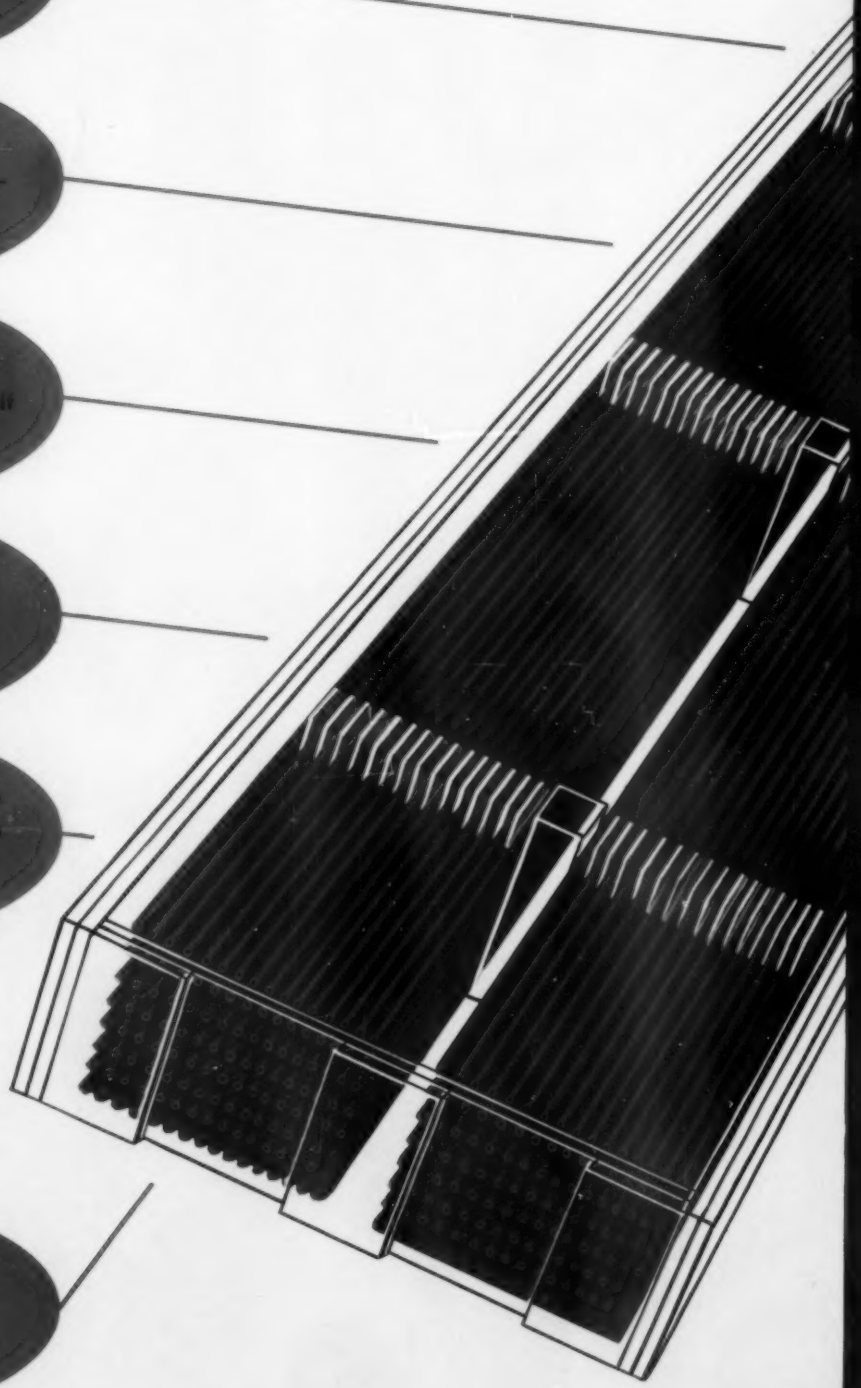
eliminates one tube sheet—

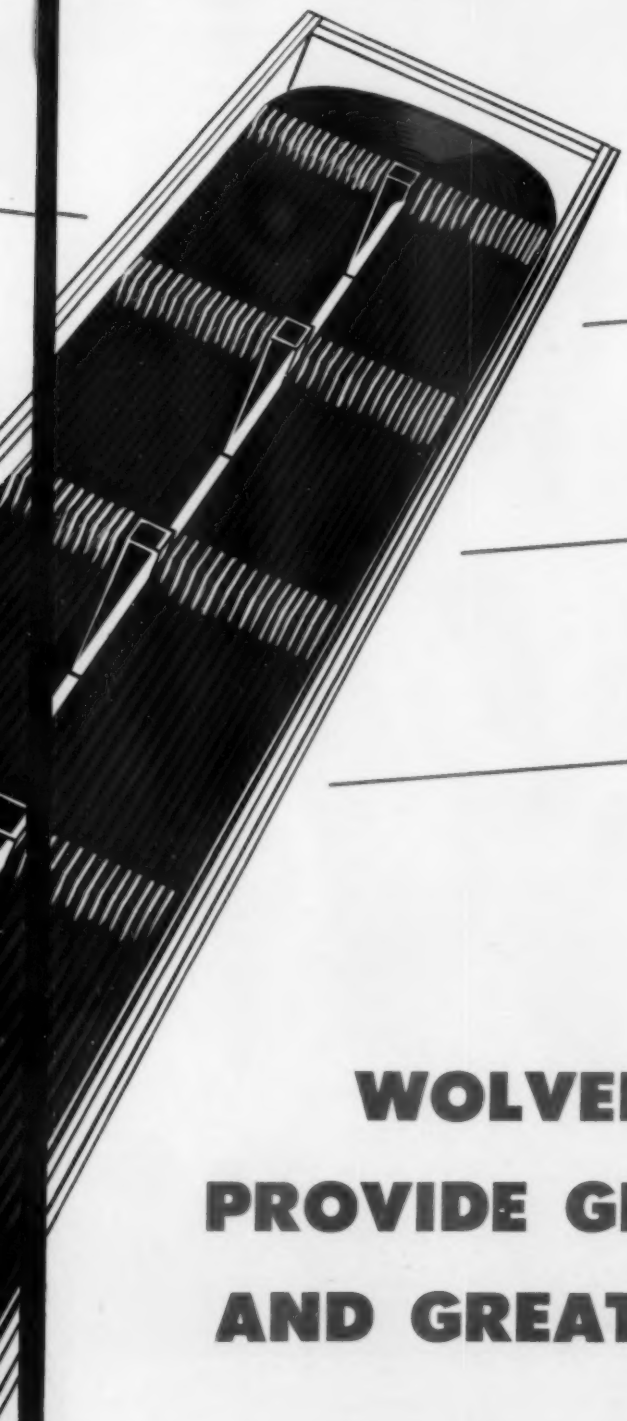
cut rolling-in operations by half

available in prime surface form or with integral fins

provide easier transportation and handling—particularly in tubes over 30 feet in length

make installations easier and faster





shipped in disposable box type pallets

available in copper, copper alloys, aluminum, seamless steel

stock complete installations, use when needed

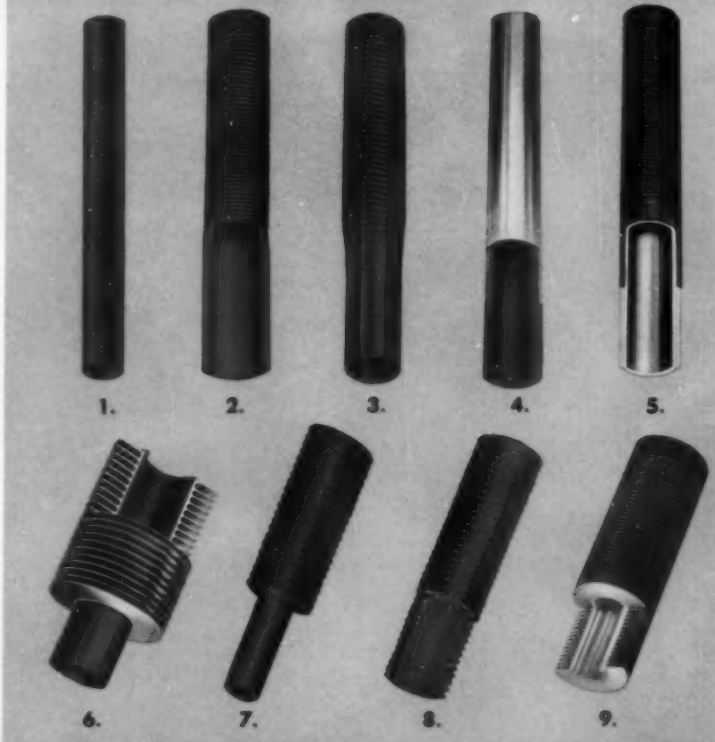
WOLVERINE U-BENDS PROVIDE GREATER ECONOMY AND GREATER CONVENIENCE

You can save time and money by specifying prefabricated Wolverine U-bend condenser tubes in either finned (Wolverine Trufin) or prime surface form. Wolverine bends these tubes to your specifications—ships them to you in the exact order of installation in disposable box-type pallets. Check the advantages listed above and then the next time you retube specify Wolverine U-bend condenser tubes. Write for complete information or talk to your Wolverine Sales Representative.

CONDENSER TUBES FOR EVERY JOB

From its years of experience in the heat transfer field Wolverine Tube has developed a condenser tube lineup designed to meet every need. Engineers can, for example, specify prime surface tube . . . integrally finned (Wolverine Trufin) or duplex tubing . . . all in a wide range of sizes and alloys. Next time you specify heat exchanger tubing remember that Wolverine Tube can meet *ALL* your needs.

1. **PRIME SURFACE TUBE**
2. **WOLVERINE TRUFIN TYPE S/T**
3. **WOLVERINE TRUFIN TYPE W/H**
4. **PRIME SURFACE DUPLEX TUBE**
5. **WOLVERINE TRUFIN—DUPLEX**
6. **WOLVERINE TRUFIN TYPE L/C**
7. **WOLVERINE TRUFIN TYPE H/R**
8. **WOLVERINE TRUFIN TYPE H/A**
9. **WOLVERINE TRUFIN TYPE I/L**



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If you're having trouble with heat transfer problems . . . such things as equipment design or alloy selection you can obtain expert help real fast. Just get in touch with one of Wolverine Tube's Technical Sales Representatives. They're as close as your telephone and because of their specialized training are fully qualified to help you solve the most difficult problems. Call on them next time you need help.

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Wolverine Trufin is available in Canada through the Unifin Tube Division, London, Ontario.

MADE IN U.S.A. TO THE STANDARDS OF AMERICAN INDUSTRY

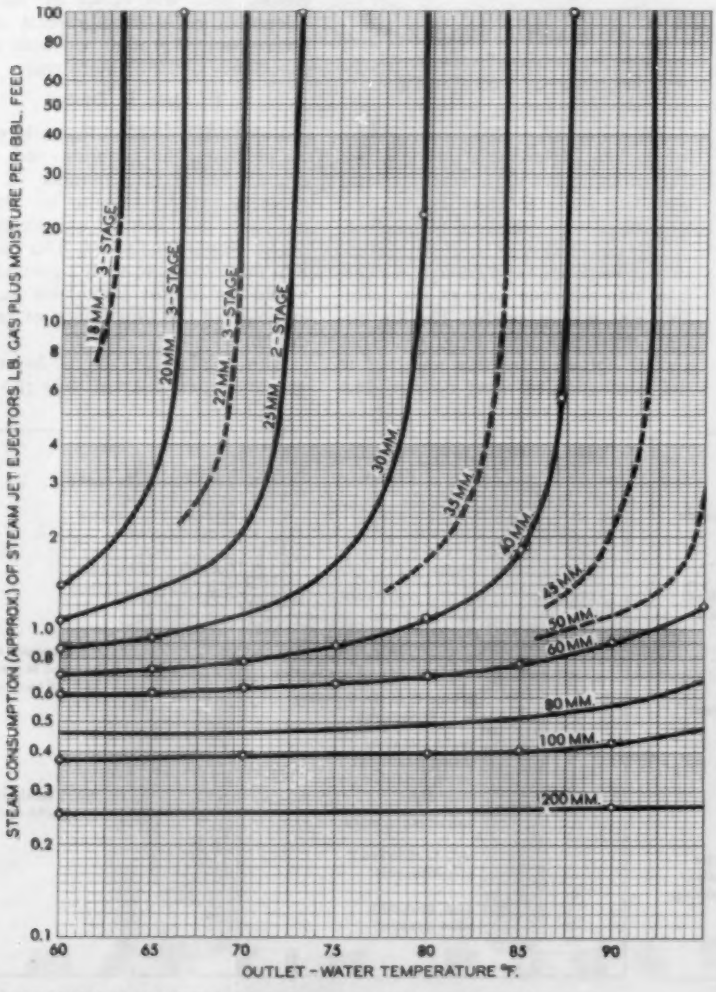
Cost of injector steam can be large

BY W. L. NELSON
Technical Editor and Petroleum Consultant

THE COST of process steam and steam to activate steam jets is often the single largest cost in the operation of petroleum vacuum units. The amount of process steam required for various feed stocks was discussed in Process Costimating No. 31 (Nov. 10, 1958, p. 148) and No. 32 (Nov. 17, 1958, p. 187).

The amount of jet steam is vitally dependent on the (1) temperature of the cooling or condensing water, and (2) amount of fixed gases that must be removed. Fixed gas is thought to range from 15 to 50 lb. per 1,000 bbl. of feed (Petroleum Refinery Engineering, p.253, fourth edition, McGraw-Hill Book Co., Inc., New York, 1958), and this contemplates no leakage of air into the equipment. A 0.2% tail of low-boiling material represents about 25 lb. of gas, decomposition to the extent of 2% results in about 10 lb. of gas, and the air dissolved in the oil and in the water used for steam may represent 2 or 3 lb. of gas. Throughout this discussion and the basis for the accompanying diagram is 25 lb. of noncondensable gases per 1,000 bbl. of feed material.

Temperature of the cooling water is important because the noncondensable gases become saturated with water vapor in the barometric (or steam) condenser, and thus the water vapor as well as the fixed gases must be ejected from the system. Thus if the outgoing cooling water is at 80° F. (some droplets before complete mixing has occurred are at 83° to 85° F.) it will exert a vapor pressure of 30.6 mm. (85° F.) and it will be impossible to operate at a pressure less than 30.6 mm. even with many stages of jets and with enormous (infinite) amounts of jet steam. The table indicates the vapor pressure that is encountered at various outlet water temperatures. Note that the rise in water temperature must be very low (5° to 15° F.) unless the temperature of the cooling water is very low.



APPROXIMATE AMOUNT OF STEAM required to operate ejectors.

Vapor Pressure of Water in Barometric Condenser for Various Outlet Water Temperatures.

Outlet water, °F.	Vapor pressure, mm.*
60	14.7-15.8
65	17.5-18.6
70	20.7-22.1
75	24.5-26.1
80	28.7-30.6
85	33.8-36.0
90	39.6-42.0

*At 3° to 5° F. higher than outlet water temperature.

The steam consumptions on the chart are thought to be average for two and three-stage ejectors. However, consumptions shown in the literature vary from 60% of those shown to as much as 160% greater (possibly due in part to uncertainties about the pounds of fixed gases handled).

The use of a booster ejector for the obtainment of lower pressures is sometimes feasible, especially if the cooling-water temperature is high. The booster is used to compress the process steam (and fixed gases) into the barometric condensers. According to W. A. Peters (Science of Petroleum, p. 1604, Oxford University Press, 1938), 0.8-0.9 lb. of booster steam is required for each pound of process steam when raising the pressure by 25 to 35 mm. to give barometric pressures of 50 to 85 mm.

How Interstate uses deep ground beds to protect bare pipelines

Deep ground beds have made cathodic protection of bare pipelines in high-resistance soil economical. A new-type deep ground bed employing graphite rods and coke breeze backfill has been successfully field tested. Here's a rundown on the design, installation, performance, and cost of the graphite-type deep ground bed.

BY ROBERT L. BULLOCK
Technical Services Section Head,
Interstate Oil Pipe Line Co.

SEVERE underground corrosion on Interstate Oil Pipe Line Co.'s system in Central and southwestern Mississippi made cathodic protection necessary. The high-resistance soil and scarcity of electric-power lines limited the cathodic units to high-current-output rectifiers.

Experience with rectifier-type units using normal surface ground beds, vertical graphite rods with coke-breeze backfill spaced 10 to 20 ft. apart, proved costly and unsatisfactory when installed in high-resistance soil. Search for pockets of low-resistance soil was disappointing but did reveal one location with low-resistance soil below a stratum of high-resistance surface soil.

Paper presented at Petroleum Mechanical Engineering Conference, ASME, Denver.

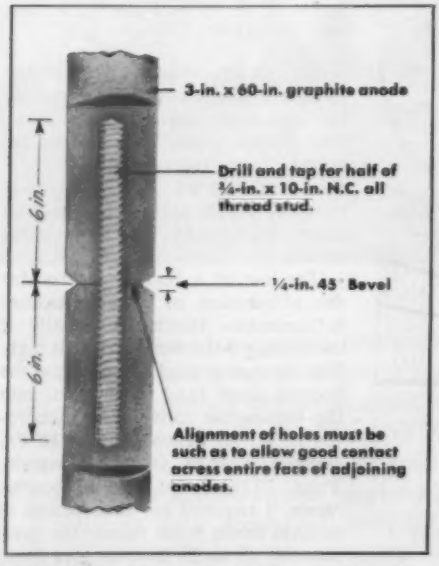
The installation of a single vertical steel ground bed, deep enough to penetrate into the deep zone of low-resistance soil, was successful. The low circuit resistance and long protective spread obtained by this unit led to the installation of other deep-ground-bed units. The successful installation of a deep ground bed in high resistance soil proved that although low-resistance soil is preferred, it is not necessary in order to obtain a low-resistance ground bed.

The disadvantage of a 6 to 7-year life expectancy of steel-type deep ground beds was offset by the development of a deep-graphite coke-breeze-backfill ground bed with a life expectancy of 20 or more years.

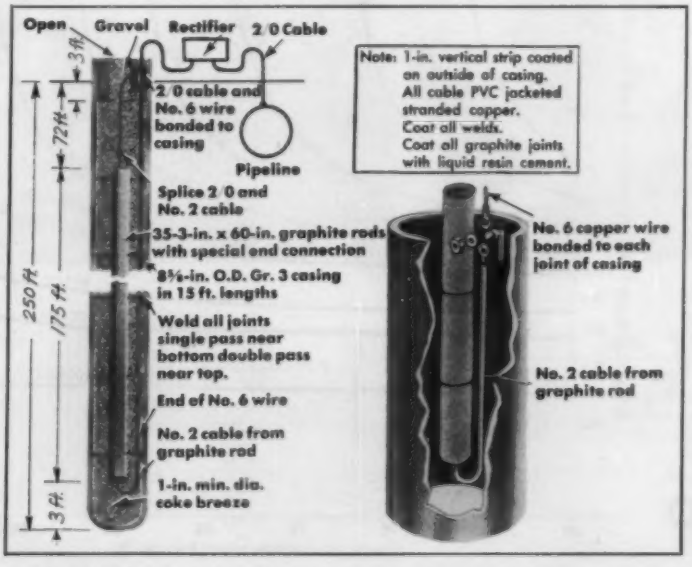
Problem in Design

It was recognized in the early stages of planning the graphite-rod deep ground bed that a number of new problems would have to be worked out, and that helpful experience by others would be limited. The realization that repairs to such a ground bed would be almost impossible further emphasized the importance of proper design.

The joining of the 3 by 60-in. graphite rods selected was the first


3-in. x 60-in. graphite anode
Drill and tap for half of ¾-in. x 10-in. N.C. all thread stud.
¼-in. 45° Bevel
6 in.
6 in.
Alignment of holes must be such as to allow good contact across entire face of adjoining anodes.

SPECIAL END CONNECTION for graphite anode. Fig. 1.


Open
Gravel
Rectifier
2 0 Cable
3 ft.
72 ft.
2 0 cable and No. 6 wire bonded to casing
Pipeline
Splice 2 0 and No. 2 cable
35-3-in. x 60-in. graphite rods with special end connection
8⅝-in. O.D. Gr. 3 casing in 15 ft. lengths
250 ft.
175 ft.
Weld all joints single pass near bottom double pass near top.
End of No. 6 wire
No. 2 cable from graphite rod
1-in. min. dia. coke breeze
3 ft.
Note: 1-in. vertical strip coated on outside of casing. All cable PVC jacketed stranded copper. Coat all welds. Coat all graphite joints with liquid resin cement.
No. 6 copper wire bonded to each joint of casing
No. 2 cable from graphite rod

DEEP GROUND-BED installation has continuous insulated wire to assure continuity. Fig. 2.

ADDITIONAL DATA: Improved Cages

MARTIN RUBBER GUIDE CAGES BY

PAT. NO. 2,591,174

Metallic back-stop is now available in Closed Type Cages by use of 18-8 insert in upper part of rubber guide. Ball never touches this metal in normal pumping.

Metallic back-stop is now provided in Open Type Cages by leaving cross bar above primary ball stop position. Ball never touches this metal in normal pumping.

THE WORLD'S MOST SUCCESSFUL
NOW EVEN BETTER!

The Martin Rubber Guide Idea, which has proven successful beyond anyone's expectation, is now available in improved form. The primary rubber ball stop for normal operation is now backed up by a metal stop to take the unusual ball impact which sometimes occurs.

Easily replaceable, mechanically held rubber guides often permit the renewal of cage life several times. They outlast metal by a great margin and usually increase ball and seat life two or more times.

Many production men specify MARTIN CAGES in all their pumps. Our cages are available in all sizes and types to take care of anyone's requirements.

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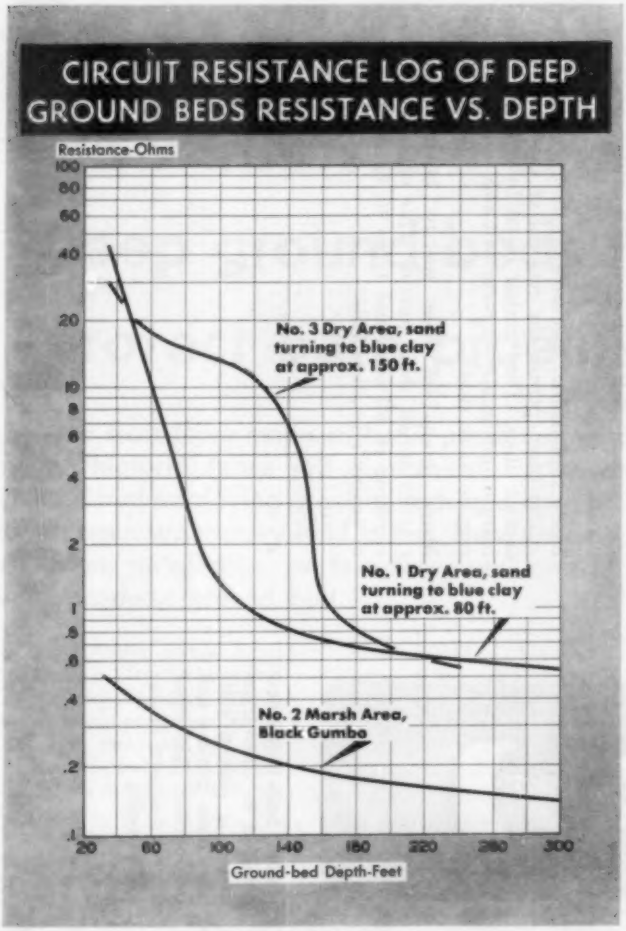


Fig. 3.

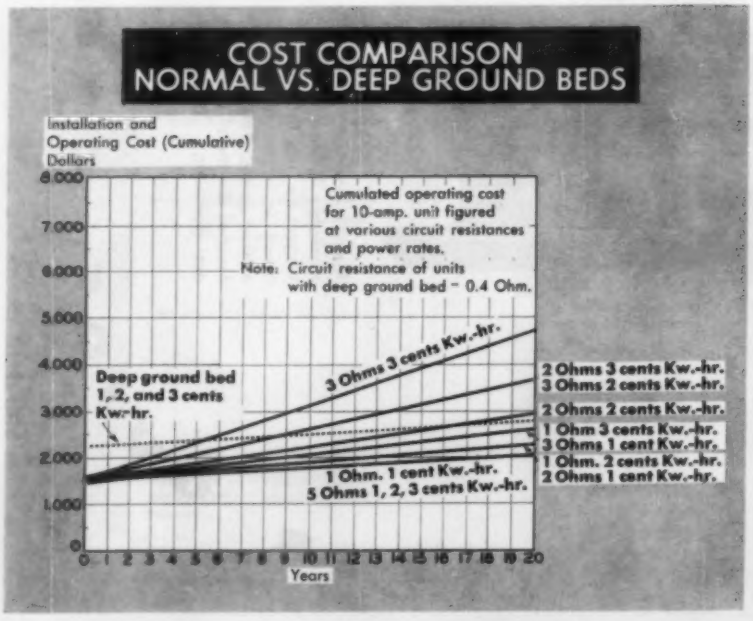

COST COMPARISON NORMAL VS. DEEP GROUND BEDS
Installation and Operating Cost (Cumulative) Dollars
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Cumulated operating cost for 10-amp. unit figured at various circuit resistances and power rates.
Note: Circuit resistance of units with deep ground bed = 0.4 Ohm.
Deep ground bed 1, 2, and 3 cents Kw.-hr.
3 Ohms 3 cents Kw.-hr.
2 Ohms 3 cents Kw.-hr.
3 Ohms 2 cents Kw.-hr.
2 Ohms 2 cents Kw.-hr.
1 Ohm 3 cents Kw.-hr.
3 Ohms 1 cent Kw.-hr.
1 Ohm. 2 cents Kw.-hr.
2 Ohms 1 cent Kw.-hr.
1 Ohm. 1 cent Kw.-hr.
5 Ohms 1, 2, 3 cents Kw.-hr.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Years

Fig. 4.

problem considered, since a break in the string of rods due to faulty joint design might cause the loss of a portion of the string of rods. Also, water penetrating the rods at the joints might cause concentrated attack and failure. Any reduction in the length of the ground bed would reduce its effectiveness.

After investigating the experience of others and discussing the project with a local sales group, the plan shown in Fig. 1 was adopted. The sales group proposed to custom-build the rods and studs as specified and to furnish a special resin-base cement sealing agent, compatible with the characteristics of graphite, for making up the joints in the field.

The problem of how to install a continuous graphite rod down a mud-filled hole drilled 250 ft. deep and at the same time place coke-breeze backfill uniformly and free of mud around the rod was considered next. Experience on normal graphite ground beds had shown severe necking of graphite rods where soil penetrated the coke backfill.

Metal casing in the form of old 8⅝-in. pipe with the graphite rods and coke breeze installed in a step-by-step, joint-by-joint method was adopted after a number of packaging ideas were discarded.

The decision to use casing brought on the third problem, that of maintaining metal-to-metal continuity in the casing in order to insure uniform and complete disintegration of the casing. Since the graphite rods and coke breeze would be shielded from operating as an anode by any portion of the casing not consumed, it was important that the corrosion rate of the casing be uniform and complete.

The expected life of the casing would depend on the current output of the rectifier, and for a 250-ft. string of 28-lb. casing, the life expectancy would vary from 11.6 years for 30 amp. to 5.8 years for a 60-amp. rectifier.

Our experience with scrap-pipe horizontal and vertical ground beds and the experience of others in installing deep metal ground beds was helpful in adopting the plans shown in Fig. 2 for connecting a continuous insulated wire to every joint of casing and to the bottom and top graphite rods. The insulated wire would insure continuity, even if the casing separated due to concentrated current drainage.

The fourth problem, gas blocking, or the trapping of gas formed at the outer surface of a ground bed, is usually caused by operating a ground bed at excessive current density drainage. Since the proposed deep ground bed would be operated at a very low

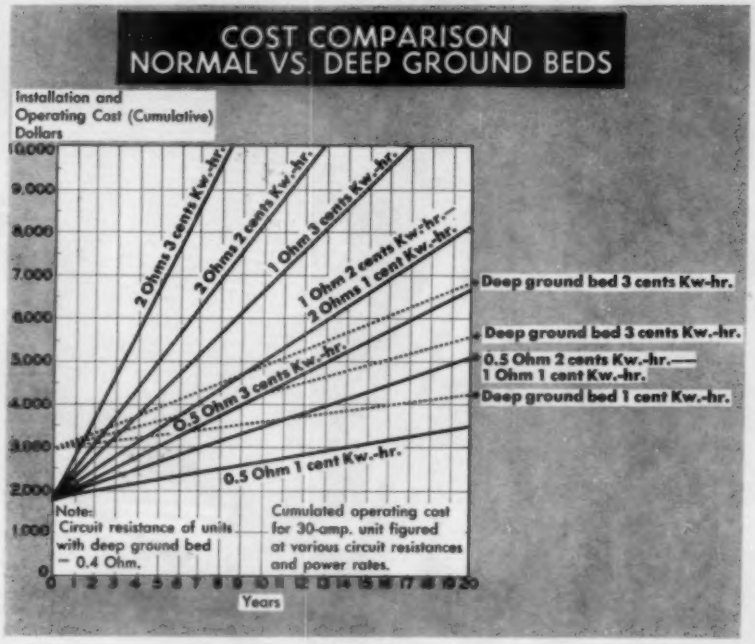


Fig. 5.

current drainage, excessive gassing was not anticipated.

It was assumed, however, that any gas formed would have to be absorbed by the soil or escape up the column of coke breeze. To obtain more favorable conditions for the gas to escape and at the same time not defeat the purpose of the backfill, the coke breeze was specified to be not larger than 1-in. diameter and not smaller than ½-in. diameter.

Installation and Cost Data

After the materials are properly assembled on location and the hole is completed, the ground bed is installed in a step-by-step method. In the first step, an 18-ft. joint of casing with the lower end closed in orange-peel fashion, to prevent mud from entering the casing, is lowered into the hole. The lower 3½ ft. of this joint is filled with coke breeze, and the first string of three graphite rods is placed in the center of the casing on top of the coke.

The bottom rod of this string has 15 ft. of No. 2 cable attached. This cable is bonded to the interior of the casing at the top, and the void between the casing and string of rods is filled with coke breeze. The rods as installed will protrude 6 in. above the coke-filled casing.

In the next step, the second set of three graphite rods is attached to the first set, and a 15-ft. joint of casing is lowered over the rods into place. No. 6 wire is fed through the second joint of casing and bonded to the first joint.

The casing is then lowered and welded to the first joint of casing. The welded string of casing is lowered, the No. 6 wire bonded to the second joint of casing, and the void between the graphite rod and casing filled with coke breeze. The casing string is then filled with water to add needed weight.

The second step is then repeated until all the rods are installed. The cable attached to the last graphite rod is carried through the added 15-ft. joints of casing with coke being added to all joints of casing to within 3 ft. of the surface of the ground. The No. 6 wire is also carried through and bonded to each joint and to the 2/0 cable on the last joint of casing. The last 3 ft. of casing is filled with gravel to filter the surface water that might enter the casing.

The procedure thus outlined is graphically shown in Fig. 2. Points of interest and helpful comments pertaining to the installation are presented in detail as follows.

Drilling . . . The drilling of the hole is the key to the success of the installation. The completed hole must be straight, large enough to easily accommodate the casing, as deep as the total length of casing, and clean of all cuttings. The side walls should be thoroughly built up with drilling mud to prevent bridging. The diameter of the hole should be at least 2 in. greater than the casing diameter.

Casing . . . The casing should be straight and cut to the lengths required. All ends should be smooth and square, so that the welded string of casing will be straight. The maximum length of casing that the drilling rig and labor can handle is 20 ft. However, faster progress can be obtained with 15-ft. joints. All joints of casing, except the bottom joint in Fig. 2, are 15 ft. long. The bottom joint is 18 ft.

A terminal post, shown in Fig. 2,

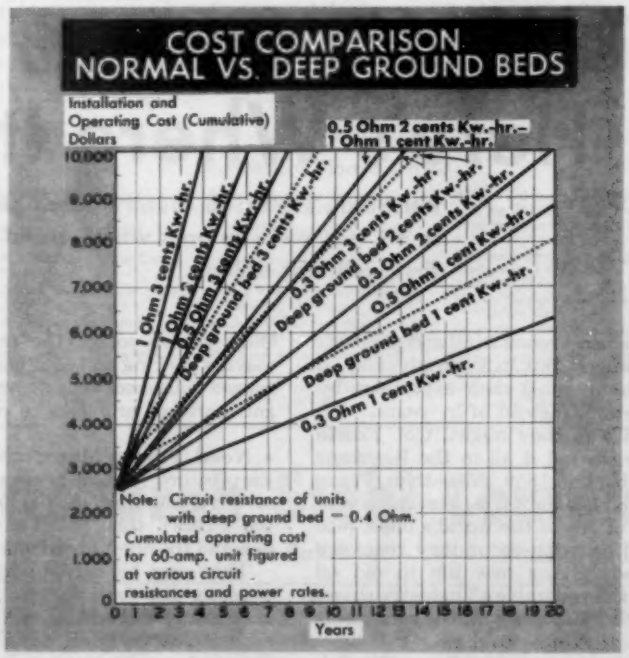
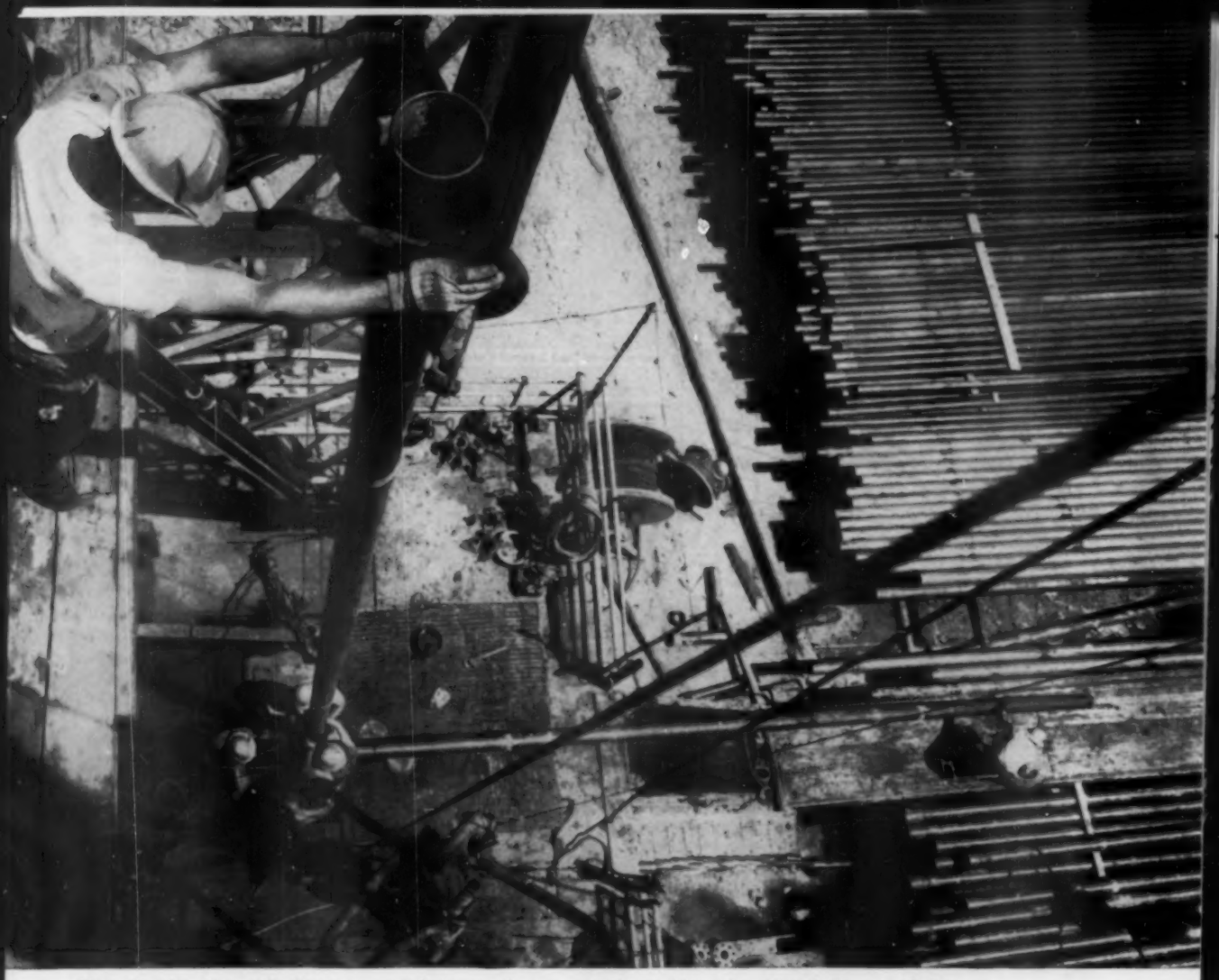


Fig. 6.



Running Casing calls for teamwork between the man on the stabbing board and the crew below.

Here's Where It Started...

Pittsburgh Steel's oil country goods still being supplied to oil, gas wells in area where world's first well was drilled

Experience pays off in oil and gas fields everywhere. But in Pennsylvania, oil and gas men log their experience by generations instead of by years.

And well they might. Col. Edwin Drake started it all in the Keystone State back in 1859. Since then, Pennsylvania has built a reputation as producer of one of the world's finest oils.

Today, with secondary recovery methods giving new life to old oil wells, the venerable oil industry shares a new importance with the continuing production of natural gas.

Drilling for gas in Pennsylvania's rugged hills is no job for amateurs. Once you've solved the problem of moving your rig and equipment across rugged hills and valleys, you've still got scores of problems to cope with.

• **Need Finest Materials**—One is gas pressure. Producers know gas pressure is something you deal with right the FIRST time. That's why they demand the finest in oil country goods.

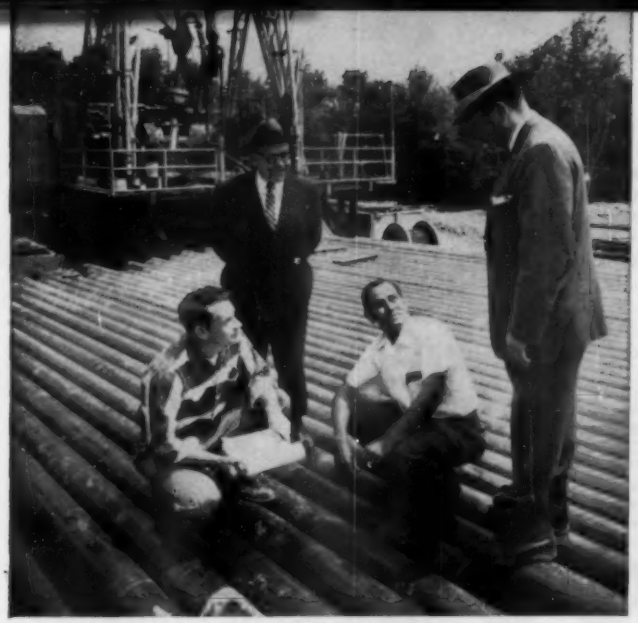
That's one big reason why the independent distributor serving this pioneer Bradford Field offers his customers seamless drill pipe, casing and tubing produced by Pittsburgh Steel Co.

Now well into his second half century of existence, this Mr. Independent started back in 1907 when the oil and gas fields of Western Pennsylvania were really booming.

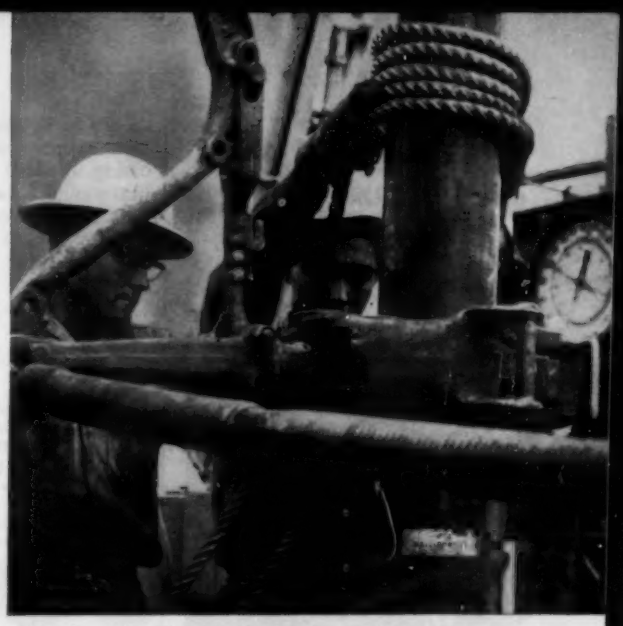
Today he's still in business in that area and has extended his operations westward to follow the new discoveries. Now his 15 branches and five shops do a good job of covering the country's oil and gas fields.

With this backlog of experience, Mr. Independent knows materials. He has a vast store of knowledge to share with customers.

He handles oil country goods made by Pittsburgh Steel Co. because they



Inspecting Casing: l. to r., Dale Croasmun, engineer for Manufacturers Light and Heat Co.; Mark Wagner, independent distributor's representative; Peter E. Douylliez, Pittsburgh Steel field engineer; and S. M. McMahon of Pittsburgh Steel.



Spinning In The Casing. The run has just started and roughnecks are threading the second joint into the first. More than 200 joints of Pittsburgh Steel Co. casing were used on this hole. Total depth was 7,242 ft.

help him meet the credo he established for his company. That credo is to offer "only the highest quality oil and gas well supplies and to give complete customer satisfaction through the best possible service."

The quality of the product he handles was demonstrated on the gas well pictured here in the Bradford Field where casing is all-important.

Because natural gas roars up the casing under pressures ranging from 2,000 to more than 4,000 pounds per square inch, casing is carefully tested in the hole before drilling continues on to pay.

• **Casing Passes Test**—On this well after drilling to 7,200 feet, operations were halted an estimated 40 feet from pay. Then Pittsburgh Steel's seven-inch J55 seamless casing was run into the 7,200-foot hole, cemented and tested.

This casing was run between noon and midnight without any delays caused by improper or damaged threads or other casing imperfections.

Behind that success was an effective combination of mill and distributor. The casing was of high, uniform quality because the skilled steelmakers and the experienced men in the Pittsburgh Steel pipe mills took the pains necessary to make sure that *every* joint met specifications.

The distributor had a big role, too.

Service rendered by the independent distributor in the Bradford Field is typical. In this area, not far from the world's first commercial oil well, independent distributors have built a solid reputation for good products, dependable service and a willingness to do more than they are asked to do.

In Western Pennsylvania's older fields, for example, secondary recovery methods have been developed to a fine art to help give new life to old wells.

Because the Mr. Independent who serves oil and gas men in the Bradford area has worked on hundreds of secondary recovery installations, he and his men have learned a lot which they're more than eager to pass on to drillers and well owners.

• **Something Special**—Like all the independent distributors listed here, this Mr. Independent has something special to offer oil and gas men . . . dependable casing, tubing and drill pipe that is supplied and serviced by men who have a real stake in the welfare of their customers.

These independents feel they are allies to the men who buy their oil country goods. The independent distributor is just that—independent. He sinks or swims according to how well his customers do.

So, tie in with Mr. Independent. He's really working for you. When you need oil country goods, pick up your phone and call the Pittsburgh Steel Co. distributor nearest you.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennsylvania
Buckeye Supply Company
Zanesville, Ohio
Cardwell Manufacturing Co.
Wichita, Kansas
C. W. Cotton Supply Company
Tulsa 5, Oklahoma
Franklin Supply Company
Chicago 5, Illinois
Houston Oil Field Material Co.
Houston, Texas
Industrial Supply Company
Wichita Falls, Texas
Iverson Supply Company
Tulsa, Oklahoma
Longhorn Supply Co., Inc.
Houston 14, Texas
Lucey Export Corporation
New York 7, New York
Lucey Products Corporation
Tulsa 19, Oklahoma
McJunkin Corporation
Charleston 22, West Virginia
Midland Supply Company
Wichita 7, Kansas
Mountain Iron & Supply Co.
Wichita 2, Kansas
Murray Brooks, Incorporated
Lake Charles, Louisiana
The Producers Supply & Tool Co.
Fort Worth 2, Texas
Production & Refining Equipment Company
Odessa, Texas
Sandy Supply Company
Wooster, Ohio
Southwest Supply Company
Pittsburgh, Pennsylvania
Superior Iron Works & Supply Co.
Shreveport, Louisiana
Western Supply Company
Tulsa 1, Oklahoma

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Experienced aircraft and engine craftsmen, armed with the best and latest tools and testing equipment, speed your work through modern shops with care and precision. We do everything from repairing a door handle to rebuilding air frames and engines. A complete line of spares and accessories eliminate delay. We are now serving oil companies and private aircraft owners throughout the U. S. and in many foreign countries.

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should be welded on the interior close to the upper end of each joint of casing. A metal knob, old ¾ to 1-in. nut, should be welded on the exterior of each joint of casing opposite the terminal. This knob helps prevent the string of casing from slipping through the bail.

A 1-in.-wide strip along the length of the casing and all welds should be wire-brushed, cleaned, primed, and coated with hot-applied coal-tar enamel. The coating will further insure continuity in the full string of casing during the final stages of consumption. All the above work, except coating of the joint welds, should be done prior to installation.

Graphite rods . . . In fabricating graphite rods, the specifications shown in Fig. 1 should be very closely followed. All rods should be thoroughly examined well ahead of installation, so that imperfect rods can be replaced. There can be no turning around or prolonged waiting for replacements once the hole is drilled, and some of the casing with rods and backfill are in the hole. Rods should be assembled into sets of three rods each in the field on location, fastened with studs, and sealed with the special resin cement.

Coke-breeze backfill . . . The coke should be sacked in strong weatherproof bags, approximately 100 lb. to a bag. This way, the coke will remain clean and can be easily installed with little waste. The coke should be very lightly tamped around the rods.

Cable connections and bonding . . . The connection between the No. 2 cable on two of the graphite rods, one at the bottom and the other at the top of the string of rods, Fig. 2, should be tight and sealed with resin cement. Special care should be taken in making the splice between the No. 2 cable on the bottom rod and the No. 6 wire and the splice between the No. 2 cable on the top rod and the 2/0 cable. The insulation applied over these splices consists of Kearney Air Seal to form out the splice, two layers of Okonite tape, two layers of Okoprene tape, two layers of Scotch No. 33 tape, and a final layer of friction tape. All completed bonds to the casing should be primed and then coated with hot applied coal-tar enamel.

A breakdown of the costs of installing a deep ground bed, material and labor, is as follows:

Drilling			
Hole drilled 250 ft. and set casing	@	$ 2/ft.	$ 500.00
Materials			
33—3 in. x 60 in. graphite rods	@	$10.50	$ 346.50
2—3 in. x 60 in. graphite rods with cable	@	$12.85	$ 25.70
100 ft.—2/0 PVC cable	@	$ .35	$ 35.00
250 ft.—No. 6 PVC wire	@	$ .11	$ 27.50
4,500 lb.—coke breeze	@	$ .056	$ 252.00
15 lb.—resin cement	@	$ 1.32	$ 19.80
250 ft.—Grade No. 3, 8⅝ in casing	@	$ .85	$ 212.50
Lot—Misc. connections		$ 5.00	$ 5.00
		Material total	$ 924.00
Supervision, labor, and expense			$ 745.00
Total cost			$2,169.00

Performance Data

A soil-resistance survey was made at each site selected, using the four-terminal method. Separation of terminals was varied from 5 to 100 ft., giving an average soil resistance down to 100 ft. These data are presented as follows:

Depth, ft.	Resistance in Ohm-Cm. Site No. 1	Site No. 2	Site No. 3
5	32,000	240	46,000
10	13,200	180	42,000
15	5,100	180	45,000
20	8,000	200	52,000
50	12,000	100	78,000
75	....	160	105,000
100	4,000	200	70,000

Survey at site No. 1 indicated a low-resistance stratum below 75 ft. The drilling log of this well showed sand turning to blue clay at 80 ft. Site No. 2 was located in low-resistance marsh soil, as indicated by the survey. Survey at site No. 3 indicated high-resistance soil down to 100 ft. The log on this well showed sand and gravel turning to blue shale and clay at 150 ft.

A log of the circuit resistance of the casing and the pipeline at each

S. E. HUEY & CO.
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site was taken as the casing was lowered, giving the resistance-versus-depth curves shown in Fig. 3. These data indicate that there was no need to go beyond 250 ft. to get a low-resistance ground bed in high-resistance soil.

The circuit resistance of each completed rectifier unit determined from the voltage and current output of each rectifier was lower than the resistance determined at the time the ground beds were installed. The resistances have gradually increased as expected and have leveled off but are still below the first value determined.

The protective spread realized from rectifier units using deep ground bed is approximately one-third more than that obtained from units of like current output employing regular surface-type ground beds. This is probably due to the position of the ground bed (anode) in relation to the pipeline (cathode) and the low circuit resistance of the deep-ground-bed unit.

Extensive tests by others have shown that interference problems with foreign structures are practically non-existent when deep ground beds are employed, especially when the resistance of the ground bed is below 1 ohm. Tests at site No. 2 employing a normal surface-type ground bed show serious anodic interference with foreign lines with bonding drainage of up to 20% of unit output required to avoid damages. Tests with the deep ground bed at this site show only slight change from off to on of unit with no bonding required.

Valuation of Deep Ground Beds

Here are the advantages of employing deep scrap metal or graphite ground beds:

1. Affords low-resistant ground beds in high-resistance soil, thus making possible economic protection to bare pipelines in high-resistant soil.

2. Geometric location in relation to pipeline and low circuit resistance gives extensive coverage.

3. Interference problems with foreign structures are minor.

4. Engineering and corrosion surveying costs in locating low-resistant soil are eliminated.

5. Expensive rights-of-way are reduced and can be eliminated, as deep ground beds can be located on existing pipeline rights-of-way.

6. Resistance remains more constant with seasonal changes.

7. The advantage of deep ground beds over conventional graphite beds is further emphasized in the cost comparisons of normal versus deep ground beds presented in Fig. 4, 5, and 6. The installation cost in each example includes ground bed, connecting cable, and mounted rectifier. An average installation cost was used for the conventional surface-ground bed examples.

These costs would be higher for high-resistance soil and lower for low-resistance soils. A minimum power charge is assumed for the deep ground bed in Fig. 4. The deep ground bed in Fig. 4 is a scrap-metal type; whereas, those in Fig. 5 and 6 are graphite-rod types.

Current requirements determine the life expectancy of scrap metal-type deep ground beds. Scrap metal is more economical than graphite if a life of 15 or more years can be expected. With this additional information, the curves presented in Figs. 4, 5, and 6 are self-explanatory and show the cost advantage of deep ground beds over normal surface types.

In concluding, the author wishes to acknowledge the assistance given by Paul Miles, William H. Mitchell, Jr., and Wilson L. Pevy, of Interstate's engineering staff in compiling data for this paper.

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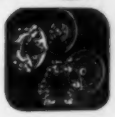

Small Spring Loaded

Heavy Duty Spring Loaded

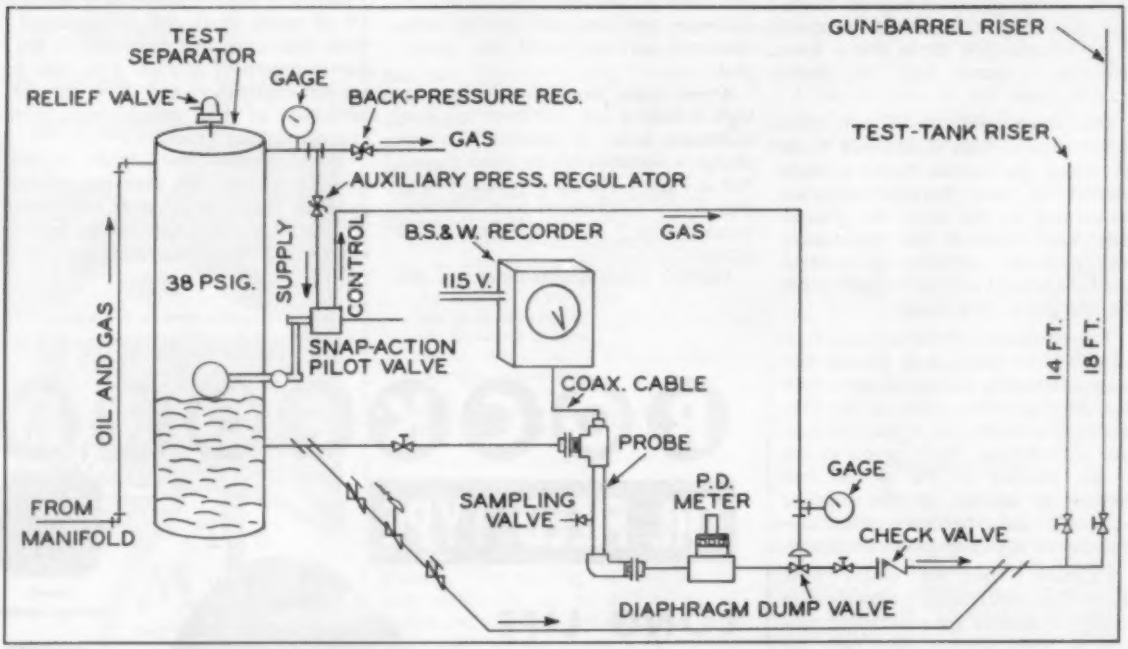
Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

CLUTCHES



ACCURACY over a large range of water percentages is an important feature of the capacitance-type b.s. and w. recorder shown schematically in a typical installation. Fig. 1.

Capacitance-type b.s. and w. recorder

features automatic, continuous operation

The large difference in the dielectric constants for water and crude oil makes this property useful in measuring water percentages. The constant for water is 80 or more; that for crude varies around 2.25.

BY ROBERT S. WOOD
Gulf Research & Development Co., Pittsburgh.

SEVERAL CIRCUITS using the basic principle of detecting dielectric constant change have been used for measuring and recording either the per cent or total amount of b.s. and w. flowing through a pipeline.

Experiments with some of them have shown that great sensitivity is possible. It has been demonstrated in the laboratory that the addition of a single drop of water can be detected in a quart of crude oil. Field experience shows that changes as small as 0.2% of water can be recorded.

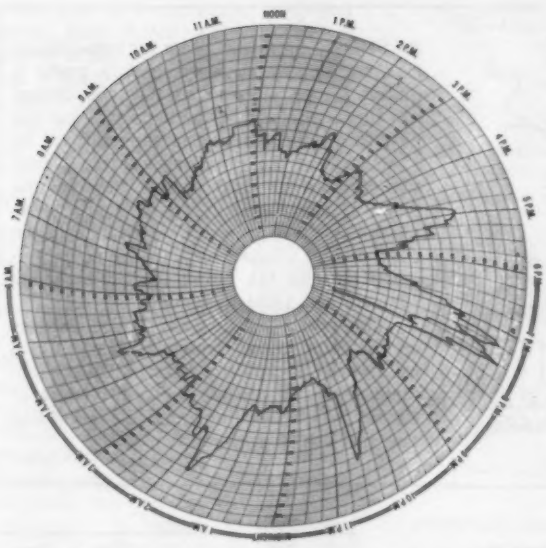
The basic instrument usually used consists of a pipe-type probe element and an electric circuit. Such a circuit with modifications is incorporated in the b.s. and w. monitor which is used for limiting amounts of b.s. and w. in custody transfer. The batch interface detector, for use in product lines, also uses the same principle. Meter provers have been designed which utilize an interface in a proven section of line, and detect its rate of movement by a similar device.

The problem of actually measuring either the per cent or total amount of b.s. and w. is complicated by the requirement of maintaining accuracy over long periods of time, and the very great percentage of variation in b.s. and w. which may be encountered.

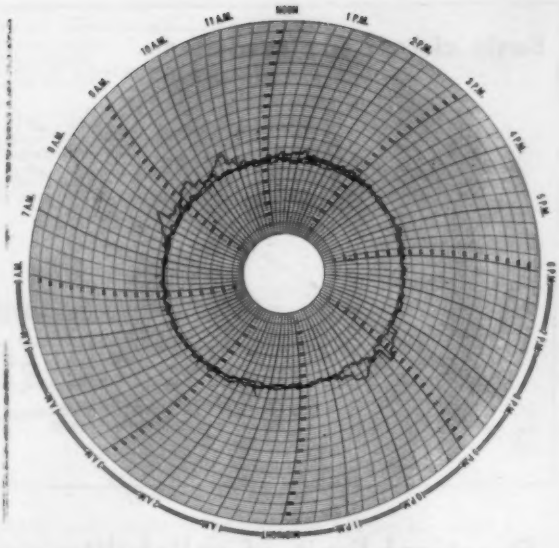
Field experience with b.s. and w. recorders has been largely experimental. It has been found that if the probe unit is placed on the outlet side of the separator above the dump valve, conditions for accurate dielectric constant measurements are ideal (Fig. 1). Pressure is uniform and flow is rapid to insure a homogeneous mixture of b.s. and w. and crude oil. Foaming is at a minimum and paraffin deposits, if any, are usually small enough to allow correction. If the chart motion is interrupted between dump intervals, the chart will not be cluttered with no-flow indications.

The major advantages of the system are: (1) the whole stream is continuously analyzed, (2) the process is automatic and unattended, (3) and the results are reliable. Accuracy of a recorder can be established under controlled laboratory or field conditions.

Paper presented at ASME petroleum division conference, Denver.



LINE SAMPLING will give poor results when b. s. and w. production varies as shown above. Automatic recording is needed. Fig. 2.



ACCEPTABLE RESULTS might be obtained with line sampling if b. s. and w. production is fairly steady. Fig. 3.

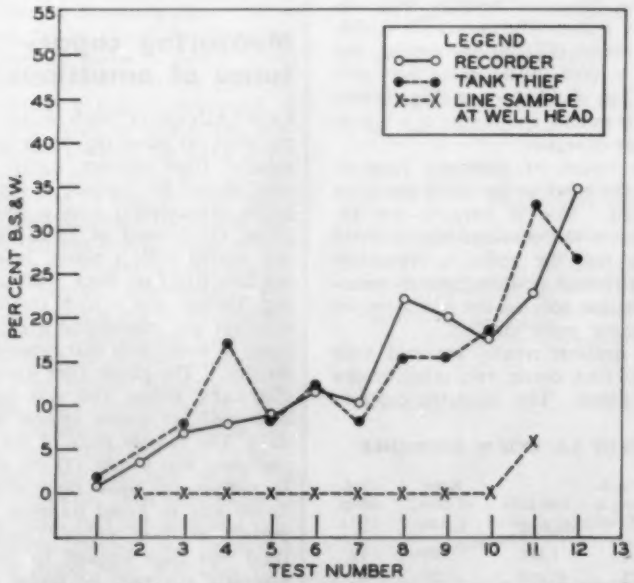
Two other methods . . . The b.s. and w. percentage can also be measured by tank thiefing and line sampling. The tank-thief method of determination is accepted by the industry, but it cannot give short time variation in b.s. and w. It is subject to human error and, unless emulsions are completely broken by chemical or other means, the tank-thief method cannot give accurate results.

Line sampling depends on the chance selection of a representative sample. These samples would not in general be truly representative of b.s. and w. production and they could not show variation in that production.

Two charts, Figs. 2 and 3, obtained during experimental field tests show contrasting types of b.s. and w. production. Fig. 2 shows large variations while Fig. 3 shows rather uniform production of b.s. and w. The scales are arbitrary and actual percentage must be obtained from calibrations. Line sampling would not give accurate results when variations such as shown in Fig. 2 exist. However, when the production is as shown in Fig. 3, the results might be acceptable.

Table 1 shows test results giving quite good agreement between tank-thief and recorder measurements. However, the agreement is for comparatively long periods of time, where short time variations are averaged out.

Fig. 4 shows a comparison of all three methods over a 6-month period taken on a single well. During test period the percentage of b.s. and w. was increasing continuously. The recorder and tank-thief methods show reasonable agreement but no correlation with line sampling at the wellhead.



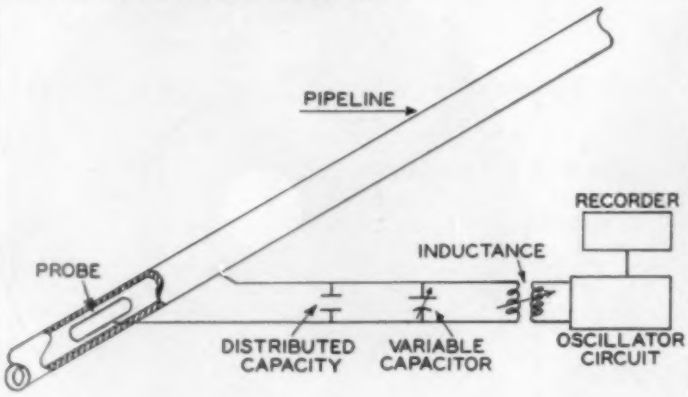
THREE METHODS of measuring b. s. and w. are compared here over a 6-month period. Note the lack of agreement between the line-sampling method and the other two. Fig. 4.

Laboratory investigation . . . The question of a b.s. and w. recorder's range of reliability is important. Field tests have established its range up to 55% water.

Early laboratory investigations disclosed that dielectric constant curves for high water percentages would show discontinuities. The exact nature and cause, however, were not known. A thorough laboratory investigation was therefore undertaken to more definitely determine the shape of these curves and the cause of the discontinuities.

Emulsions containing up to 50% water were easily produced by a high-speed stirrer. Both crude oil and brine were placed in the stirrer and agitated. This method is called normal mixing. With emulsions containing above 50% of water, the oil often separated before measurements could be made. Because of aeration and

Basic circuit for recorder



AS SHOWN in this diagram for capacitance-type b.s. and w. measurements, a probe is placed in the pipeline so that the central rod forms one side of the capacitor and the pipe forms the other. The capacity will be a function of the geometry and the dielectric constant of fluid passing between the plates at any moment. There is also some fixed distributed capacity, much of it in the coaxial cable connections. A variable capacitance permits the circuit to be tuned to resonate at a fixed frequency.

The probe capacitance change detunes an oscillator circuit which is then retuned by a variable capacitor. This is done automatically by a suitable motor-driven servo system which also operates the recording pen through a gear mechanism.

"Practical limit of reliability appears to be region of 50 to 60% of water."

cavitation, measurements were not made during stirring.

For higher percentages of water, emulsions were produced in two ways: (1) by normal mixing with detergent (Triton X-100) added; (2) by adding water slowly to crude oil during the stirring process. In the second method no detergent was added, and a more stable emulsion was obtained, often stiff and buttery in texture. An emulsion up to 80 or 90% water could be produced in this way.

Capacitance measurements were made while immersing a special probe in the emulsion, the central element of which was coated by an insulating plastic film. The arrangement is shown in the box entitled, "Measuring Capacity of Emulsions." The circuit is similar to that shown in the box, "Basic Circuit for Recorder Unit," but without automatic retuning. The capacitance was determined by a calibrated precision condenser. Electrical resistance of the emulsion was also measured using an impedance bridge and an uncoated central probe.

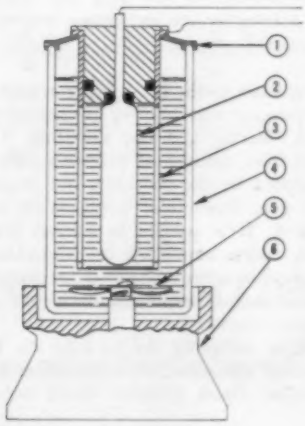
Laboratory-test results . . . The curves shown in Figs. 5 to 10 give dielectric constant and resistance as they vary with water per cent. The first three curves are for a Middle East crude. Fig. 5 is for 90,000 p.p.m. salinity. The solid dielectric constant line breaks between 50 and 60% water, values jumping from 10 to 1,000. Simultaneously, the resistance drops from approximately 9 million to 100 ohms or less. Both changes are large. The dashed line, representing dielectric constant for the mixing procedure in which water is slowly added to emulsion, is continuous to 90% and the resistance remains high, up to 70% water. The curves for 6,000-p.p.m. brine (Fig. 6) are similar, the break at 60% water being very evident. For distilled water (Fig. 7), the break is smaller and occurs at a higher per cent of water.

The values of dielectric constant above the break in the curve are often scattered. This is because the resistance of the emulsion has dropped so low that the probe is practically short-circuited, and the capacity measured is due only to the insulation on the central probe element.

To confirm results obtained with Middle East crude, two other crudes were tested. The dielectric-constant

TABLE 1—WEEKLY REPORT OF OPERATIONS OF B.S. AND W. RECORDER

Well No.	Length of test, hours	Recorder b.s. and w. %	Test tank b.s. and w (thief) %	Test tank gage, gal.	Rate of flow, g.p.m.	Avg. temp. (°F.)
3	21	36.7	36.2	6,880	5.47	72
1, 10	15½	30.5	32.2	12,058	12.99	72
1, 10, 11	4½	18.5	21.5	5,243	19.41	72
4, 10	15	29.0	30.6	13,180	14.6	85
10	15½	54.7	52.7	7,915	8.5	80



Measuring capacitance of emulsions

CONTAINER (4) with stirrer (5) mounted on stand (6) was a commercial fluid blender. Cover (1) was altered to support a special probe arrangement with a central probe (2) formed of ½-in. brass rod coated with a plastic insulating film 0.007 in. thick. This coating, Ucilon, has a high dielectric constant and constituted a capacitance in series with that formed by emulsion. The plastic film was mechanically strong and was tested electrically to insure against holidays. The outside plate of the capacitance was a tube (3) cut away in portions to allow fluid stirring inside and to avoid trapping any portion of fluid within. Level of fluid was high enough to insure complete coverage of probe portion.

curve for a West Texas semisweet crude with 6,000 p.p.m. brine is shown in Fig. 8. This crude was also run with distilled water (Fig. 9), and again a relatively small break in the curve was observed. Resistance in this case did not drop to such a low value, but in general confirms previous results.

A final test was run with a West Texas sour crude (Fig. 10). Resistance dropped at relatively low percentage of water, but otherwise the trend was consistent with earlier tests.

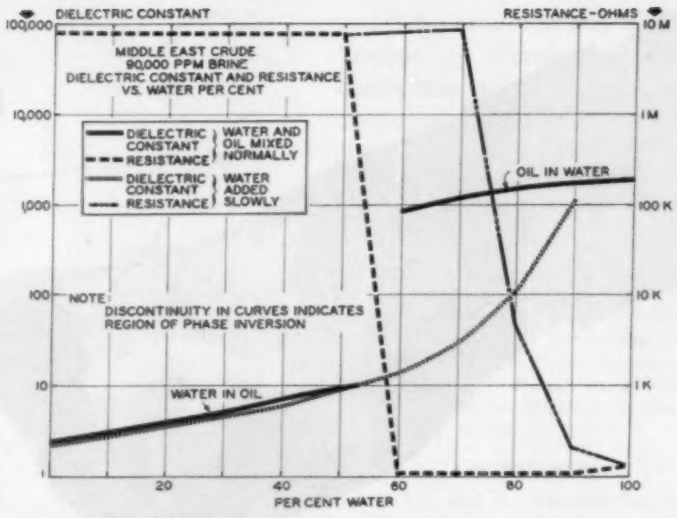
Discussion of results . . . The phenomenon of inversion or phase reversal explains the test results. At low percentage of water, brine droplets are completely surrounded by oil so the resulting mixture is of high electrical resistance and capacity measurements can readily be made. At high percentage of water, the brine forms the outer continuous phase completely surrounding the oil. In this case the electrical resistance is low and the capacity-measuring probe is effectively short-circuited. The high capacity measured under such conditions is simply that of the insulation film on the probe and has no significance as far as crude-oil emulsion is concerned.

Two distinctly different types of emulsion were produced in the laboratory. They differed from each other greatly in appearance, texture, and in the shape of the dielectric curve obtained. The difference was evidently in the size of the water drops produced and the ability of the crude to surround each drop with a tough film of insulating oil.

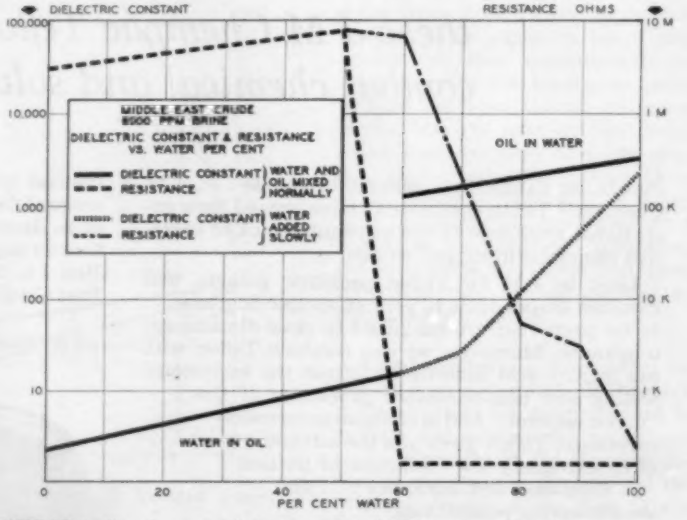
When oil is placed in the mixer first, and the water is slowly added while mixing, the inversion apparently occurs at a higher percentage of water. This may be due to the mixing process in which the water drops are smaller and each one is surrounded by an oil film. In cases where the mixture becomes thick and buttery, the mixing is incomplete so that portions may be inverted while other portions remain uninverted. This could account for the more continuous dielectric constant curve obtained.

In normal production, emulsions having even greater differences may be found. The temperature at which they are produced, the natural emulsifiers in crude, and the type of wellhead equipment, all may affect the type of emulsion. It is reasonable to suppose, then, that the dielectric constant curves obtained for emulsions found in lease lines will also vary widely.

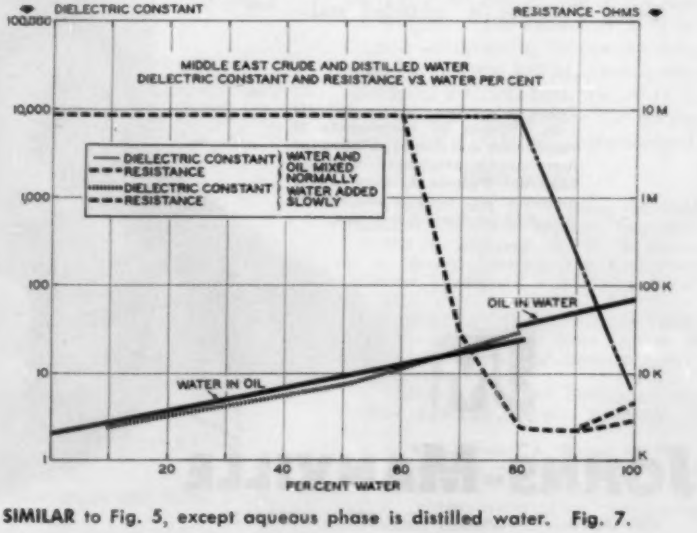
Based on the laboratory tests, it appears that with up to 50 or 60% of



DIELECTRIC CONSTANT and resistance of oil-water system for Middle-East crude and 90,000 p.p.m. brine. Fig. 5.



SIMILAR to Fig. 5, except brine contains 6,000 p.p.m. Fig. 6.



SIMILAR to Fig. 5, except aqueous phase is distilled water. Fig. 7.

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You can also obtain J-M Chempac Teflon Packings in moulded and braided types for pumps and valves . . . in a wide range of flange and envelope-type gaskets . . . in rings, cups, sheets and tapes. Your J-M Packings Distributor can supply your needs. Or write Johns-Manville, Box 14, New York 16, New York. In Canada: Port Credit, Ontario.

*TM for DuPont Tetrafluorethylene resin.

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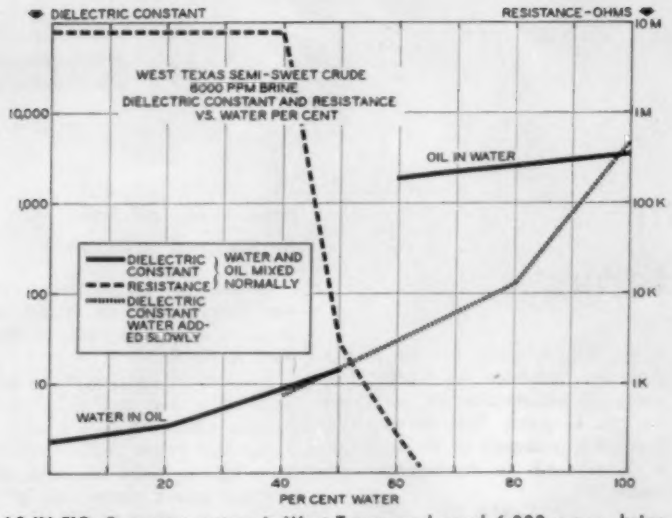
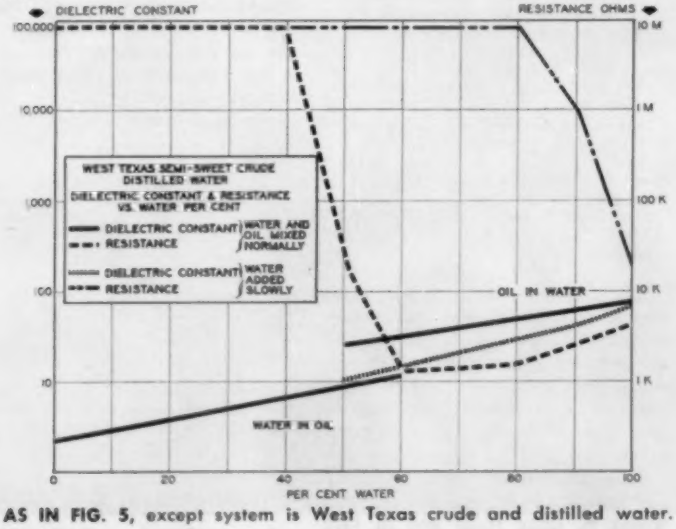
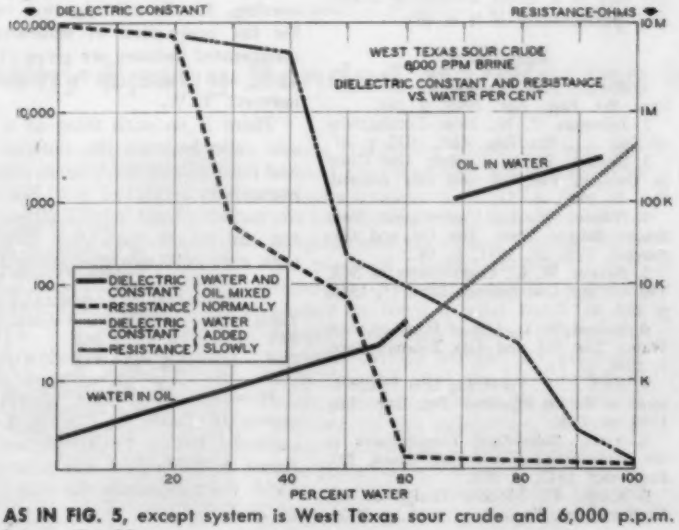


AS IN FIG. 5, except system is West Texas crude and 6,000 p.p.m. brine. Fig. 8.



AS IN FIG. 5, except system is West Texas crude and distilled water. Fig. 9.



AS IN FIG. 5, except system is West Texas sour crude and 6,000 p.p.m. brine. Fig. 10.

"If the emulsion has a continuous oil phase, measurements are reliable; but if the continuous phase is brine, the measurements are meaningless."

water, dielectric constant curves are continuous. Above this value there may or may not be an abrupt discontinuity. Continuity may be obtainable to a very high water percentage, up to 100%, with distilled-water emulsions. With brine it may be possible to approach, but not attain, valid measurements up to 100%.

Conclusions

The b.s. and w. recorder has an upper water limit determined by the nature of emulsions measured. In production these vary widely and may differ from those formed in the laboratory. If the emulsion has a continuous oil phase, measurements are reliable; but if the continuous phase is brine, the measurements are meaningless. On the basis of field experience and laboratory tests, the practical limit of reliability appears to be in the region of 50 to 60% of water. With this limitation, and where other conditions are adequately controlled, the instrument is reliable and more convenient than manual methods of measuring b.s. and w.

Acknowledgment . . . The author expresses appreciation to Gulf Research & Development Co. for permission to prepare and present this paper and to the personnel of the Houston district of the Houston division and the Midland district of the Fort Worth division who furnished every possible assistance and cooperation in the field test program. The assistance of W. R. Grinder in obtaining laboratory data, of R. M. Howard and M. Ratway who conducted the field tests, and of H. J. EnDean and N. Marusov for invaluable advice is gratefully acknowledged.

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Heat losses from buried storage tanks

We have been trying to obtain data on heat losses from uninsulated tanks buried underground but have been unsuccessful. We would appreciate such data. S.S.G.

Although this question has arisen repeatedly, apparently no basic discussions other than those published on this page (see references) have been noted. Nor is it likely that a satisfactory answer will become available because of the complexity of the many situations that can arise.

The major difficulties are:

1. How far will the heat travel and in what direction? Most will, of course, be transferred to the surface of the ground, but much heat will also be used to heat the surrounding soil, even below the tank and then outward coming finally to the surface.

2. Soil conductivity depends, of course, upon the kind of soil and how tightly it is packed, but of greater significance is its wetness. Flooded soil, according to Johnston[2] has the same conductivity regardless of the density of the soil.

The author has not recently examined the pipeline literature but this would be the best place to look for information. In general, viscous oil lines must be reheated at about the following distances:

Diameter (in.)	Miles
4	3-5
6	6-8
10	11-14
20	27-37

These distances are based on heating the oil to a temperature 25% higher than the desired line temperature (for 100 S.U.s. viscosity at 100° F.) and allowing the oil to be cooled to two-thirds of this temperature.

The conductivity of soil is indicated in Table 1 (Petroleum Refinery Engineering, fourth edition, p. 529, McGraw-Hill Book Co., 1958.[1 8] A heat-transfer rate of 2.0 is suggested by Reid[7] for lines buried 30 in. deep in sandy loam. Calculations are indicated by Karge[9] but not much information on the transfer rate is given. Soil conductivity is related to density of the soil[5] but moisture tends to confuse the situation.

TABLE 1

Thermal Conductivity of Soils, B.t.u. per Sq. Ft. per °F. Temperature Difference (to Air at Surface) for the Thicknesses of Cover Indicated

Sandy soil:	
Dry, 24-in. cover	0.25-0.40
Moist, 24-in. cover	0.50-0.60
Soaked, 24-in. cover	1.1 -1.3
In river, 60-in. water, 60-in. cover	2.0 -2.5
Sandy soil, dry, 8-in. cover	1.2 -2.4
Clay soil:	
Dry, 24-in. cover	0.2 -0.3
Moist, 24-in. cover	0.4 -0.5
Moist to wet, 24-in. cover	0.6 -0.9

The author of this page concludes that transfer rates may be as low as 0.2 B.t.u. per sq. ft. per degree temperature difference in extreme cases, with wet sandy soil showing rates of 1.3, whereas soil that is soaked in water may provide rates as high as 2.5.

In direct answer to the question, the heat losses from a buried tank would be quite small and in fact the soil is a good insulating material, particularly if it is dry.

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How does oil rate in thermal efficiency

In some of your previous answers, you suggest that oil is not much more efficient than coal. Is this still true? S. W. F.

It is still the opinion of this department that coal can be fired at a thermal efficiency that is only 3 to 5 per cent below that of oil. However, this is based on large, highly efficient power plants, and in many smaller or unattended installations the efficiency, when burning oil, should greatly surpass that of coal. If you want higher efficiencies for oil you can refer to the references given in our Questions on Technology of January 12, 1953, p. 131, which shows the following thermal efficiencies:

Coal	Oil	Superiority of oil
50	85	35
50	70	20
60-65	70	5-10
60-65	65-70	5
61-85	75-85	to 14
*67.7	*76.1	8.4
74	76	2
75	78	3

*Power Engineering, August, 1951, p. 86. Shows efficiencies of 70.7% for wood, and 51% for wood slab for the same boiler.

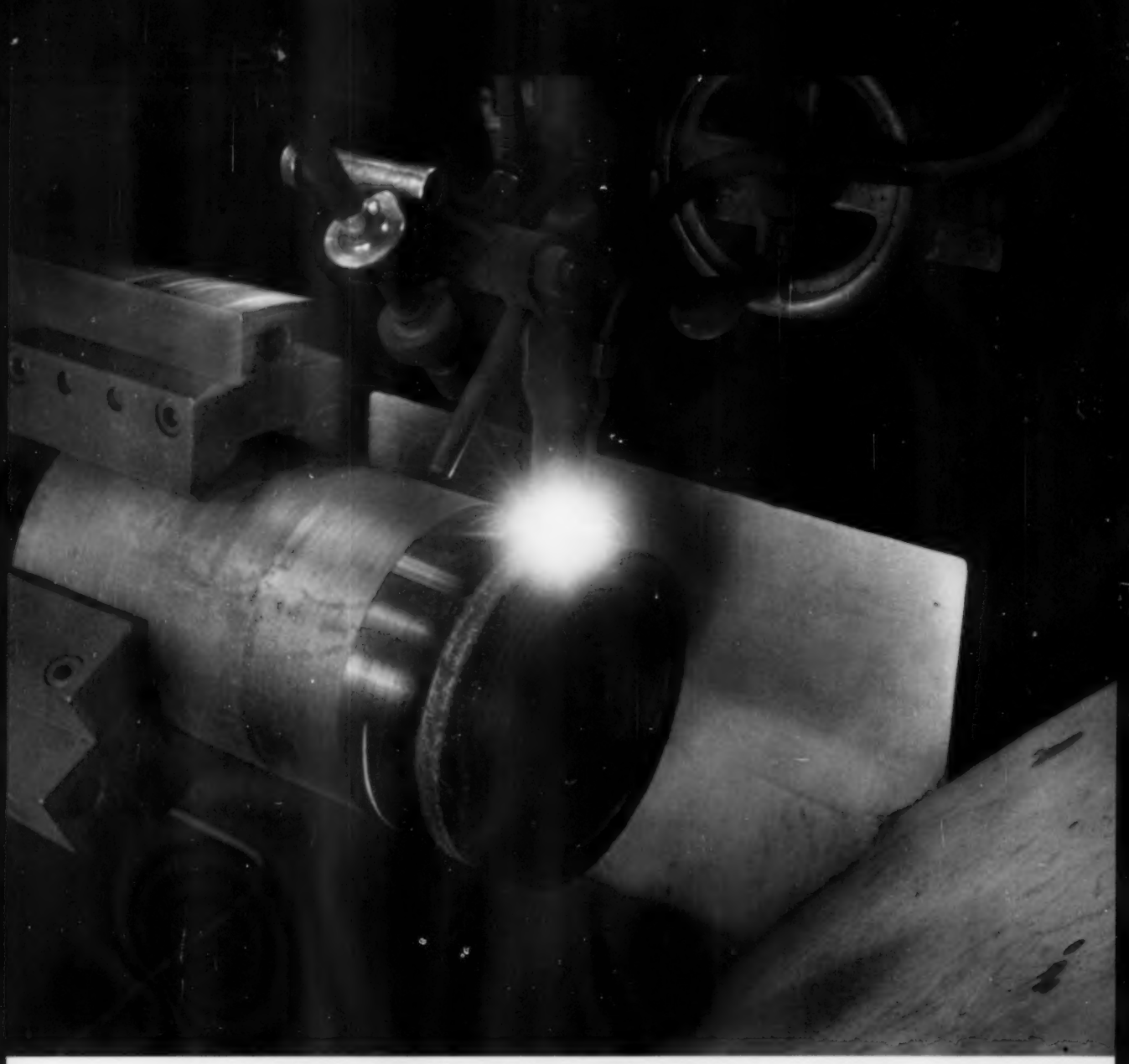
Unsaturates in B-B cut

In your Petroleum Refinery Engineering, fourth edition, two values for the proportion of saturated to unsaturated butanes are given (Table 21-4 and Table 20-7). Which is correct? G.W.

There is no such thing as a precise ratio between the butanes (iso and normal) and the butenes (iso and normal) in a cracked gas. Not only do various plants behave differently, but the results vary each day and with each different charge stock.

Table	% Butenes in B-B cut
20-7	36.2
21-4	40.0 (21-49 range)

However, the 36.2% unsaturates shown in Table 20-7 are old data collected before 1949, whereas the figure in Table 21-4 was selected in 1956. Note especially the wide range of 21-49%.



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Spang Hardfacing affords the best protection ever developed for tool joints in abrasive formations.

The method of application is the tungsten inert gas welding process. Multiple bands of tungsten carbide are continuously overlapped on the scale-free surface to form a solid band. In the tungsten inert gas welding process, the tungsten carbide particles are automatically "plowed into" the joint surface in exact, metered quantities. No grooves are required for this application, and everything is automatically controlled to eliminate human error. Each joint is pre-heated to further insure a perfect bond between the parent metal and hardfacing material. Each tool joint is stress relieved after hardfacing to make sure the physical properties of the parent metal are not impaired.

The results of these careful operations are: high saturation and uniform distribution of tungsten carbide particles—on the surface *and* throughout the depth of the deposit; a solid band of protection—providing a surface resistant to abrasion where the wear occurs; high resistance to chipping because of the solid particle-to-metal bond.

Spang Hardfacing is a typical result of National's product research and development program. Like all Spang processes and products available at National Supply, quality control insures its superiority.

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The streamlined interior and exterior contours of this high quality casing provide for maximum running efficiency—no shoulders to hang-up on hole projections, or to scrape mud seal from the walls of the hole. SPANG'S high strength integral joint provides a minimum of threaded connections—and this means less possibility of joint trouble.

Precision-manufactured SPANG Extreme Line Casing pays off *in* the well, too. It has the mechanical and metallurgical properties to withstand high tensile loading, and to resist the severe pressures found in present-day deep drilling. Its rugged integral joint is 100% leak-resistant—a highly important factor in deep, high-pressure wells. Another outstanding fact is that SPANG Extreme Line Casing can be salvaged and re-run repeatedly.

You can easily get more information about this quality casing *in terms of your specific needs* by calling the National Supply representative in your area. Find out soon how SPANG Extreme Line Casing can save you money in the long run.

Spang Casing ready for action on a well in Texas. You can get Spang Extreme Line Casing in three grades for every well condition—J-55, N-80 and P-110. The size range is 5" O.D. through 10¾" O.D.

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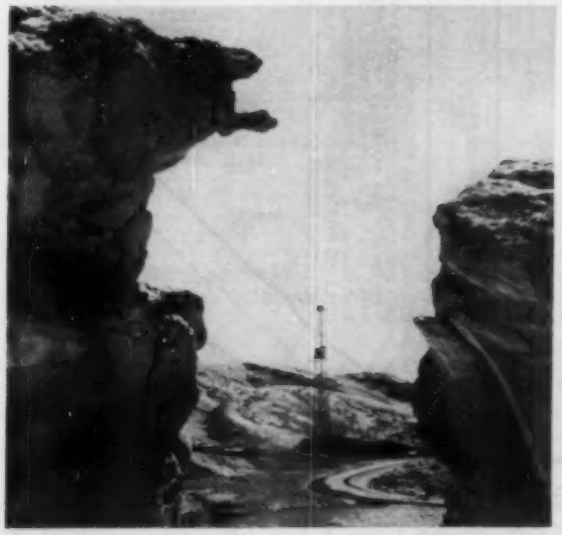
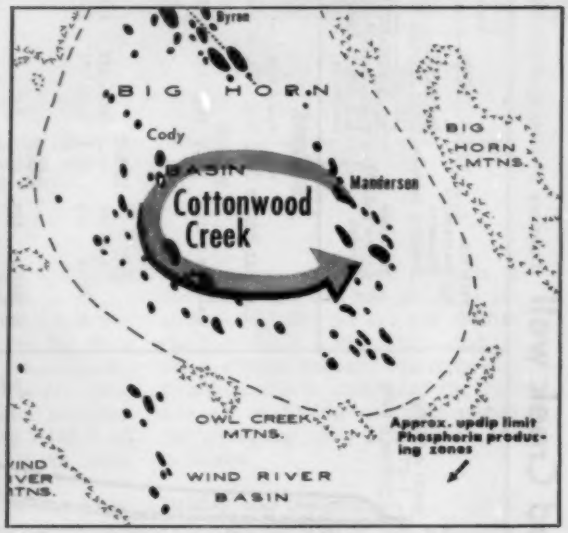


RUGGED TERRAIN makes for expensive drilling at Cottonwood Creek.



COTTONWOOD CREEK FIELD lies on the east flank of the Big Horn basin.

Huge strat trap outlined

by Wyoming drilling

COTTONWOOD CREEK in Wyoming's Big Horn basin is rapidly emerging as the best oil field found in the state in the past 5 years. Today its daily production of 15,000 bbl. makes it Wyoming's second-largest oil producer, topped only by Elk basin.

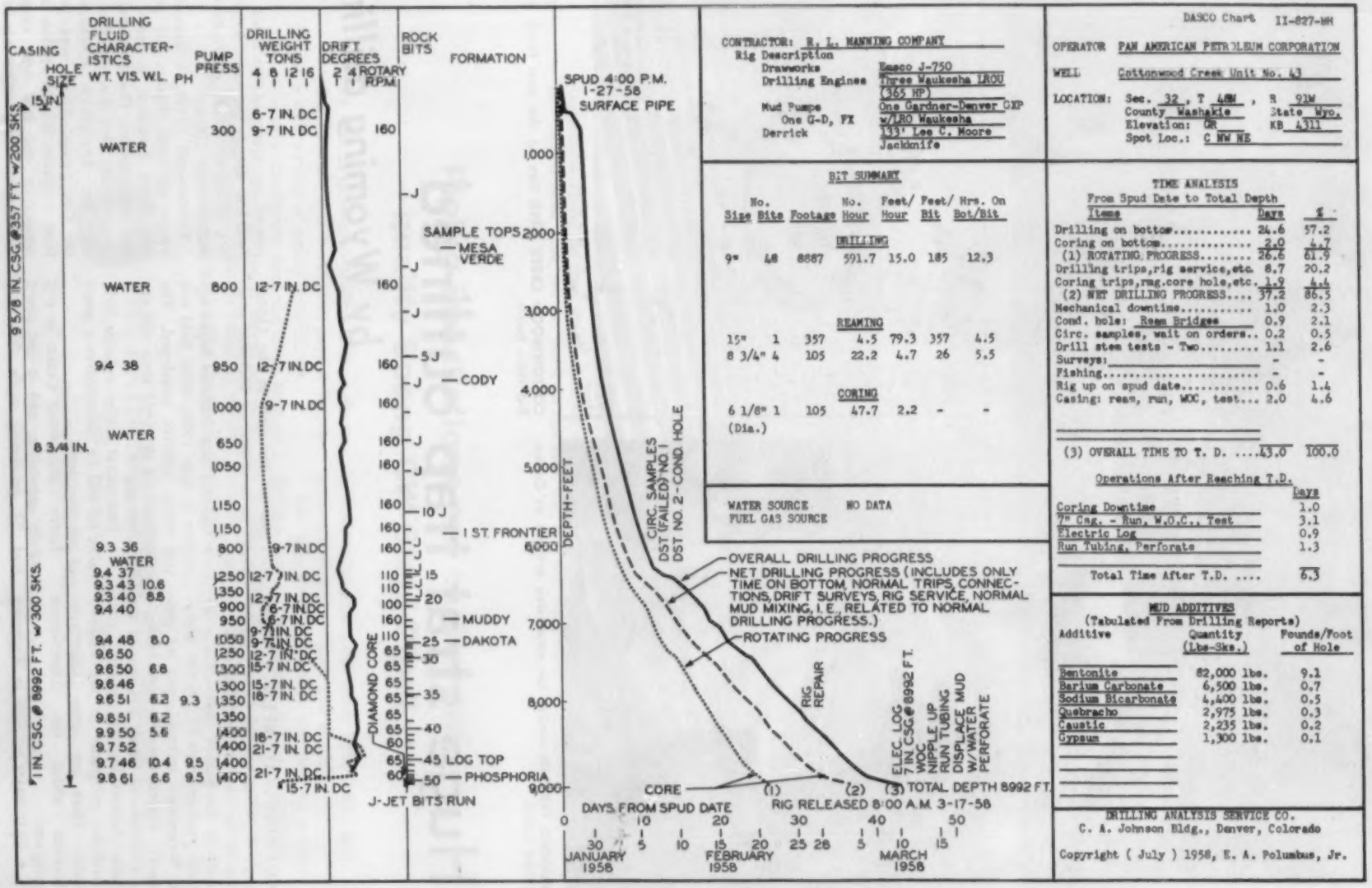
Cottonwood Creek has one of the most forward-looking oil-field conservation programs in the industry today. Here are some noteworthy features about the conservation program:

- First major oil field in Wyoming and one of the first in the United States to be drilled on 160-acre spacing.
- Gas-injection facilities began operation in June 1958, while field was still being actively developed. The boundaries of the field have still not been defined.
- Theoretical studies indicate 50% more oil will be recovered as a result of gas injection.

Today Cottonwood Creek is still rapidly expanding, and at last count had 73 producing wells that had proved up some 14,000 acres. The field has already produced 9,000,000 bbl. of oil and daily production per well averages 200 bbl.

Cottonwood Creek is basically a simple oil field. Updip, the porous Phosphoria limestone becomes tight and unproductive. The initial exploration thinking used this line of reasoning: The Phosphoria limestone in the Cottonwood Creek area graded from a porous marine section into a nonporous red bed and evaporite facies updip. The problem was to find

Drilling curve on a typical Cottonwood Creek well (Courtesy Drilling Analysis Service Co.)



CONTRACTOR: R. L. MANNING COMPANY
Rig Description
Drawworks: Emsco J-750
Drilling Engines: Three Waukesha 1R00 (365 HP)
Mud Pumps: One Gardner-Denver GXP One G-D, FX w/1R0 Waukesha
Derrick: 133' Lee C. Moore Jackknife

DASCO Chart II-827-MH

OPERATOR: PAN AMERICAN PETROLEUM CORPORATION

WELL: Cottonwood Creek Unit No. 43

LOCATION: Sec. 32, T 44N, R 91W
County Washakie, State Wyo.
Elevation: GR, KB 4311
Spot Loc.: C NW NE

BIT SUMMARY

No. Size	Bite	Footage	No. Hour	Feet/ Hour	Feet/ Bit	Hrs. On Bot/Bit
DRILLING						
9"	48	8887	591.7	15.0	185	12.3
REAMING						
15"	1	357	4.5	79.3	357	4.5
8 3/4"	4	105	22.2	4.7	26	5.5
CORING						
6 1/8" (Dia.)	1	105	47.7	2.2	-	-

WATER SOURCE: NO DATA
FUEL GAS SOURCE

TIME ANALYSIS
From Spud Date to Total Depth

Items	Days	%
Drilling on bottom	24.6	57.2
Coring on bottom	2.0	4.7
(1) ROTATING PROGRESS	26.6	61.9
Drilling trips, rig service, etc.	8.7	20.2
Coring trips, rmg. core hole, etc.	1.9	4.4
(2) NET DRILLING PROGRESS	37.2	86.5
Mechanical downtime	1.0	2.3
Cond. hole: Ream Bridges	0.9	2.1
Circ. samples, wait on orders	0.2	0.5
Drill stem tests - Two	1.1	2.6
Surveys:	-	-
Fishing	-	-
Rig up on spud date	0.6	1.4
Casing: ream, run, WOC, test	2.0	4.6
(3) OVERALL TIME TO T. D.	43.0	100.0

Operations After Reaching T.D.

	Days
Coring Downtime	1.0
7" Csg. - Run, W.O.C., Test	3.1
Electric Log	0.9
Run Tubing, Perforate	1.3
Total Time After T.D.	6.3

MUD ADDITIVES
(Tabulated From Drilling Reports)

Additive	Quantity (Lbs-Sks.)	Pounds/Foot of Hole
Bentonite	82,000 lbs.	9.1
Barium Carbonate	6,500 lbs.	0.7
Sodium Bicarbonate	4,400 lbs.	0.5
Quebracho	2,975 lbs.	0.3
Caustic	2,235 lbs.	0.2
Gypsum	1,300 lbs.	0.1

DRILLING ANALYSIS SERVICE CO.
C. A. Johnson Bldg., Denver, Colorado

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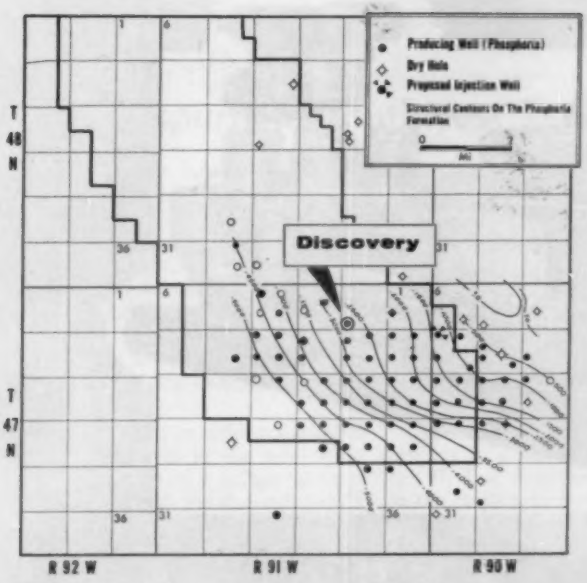
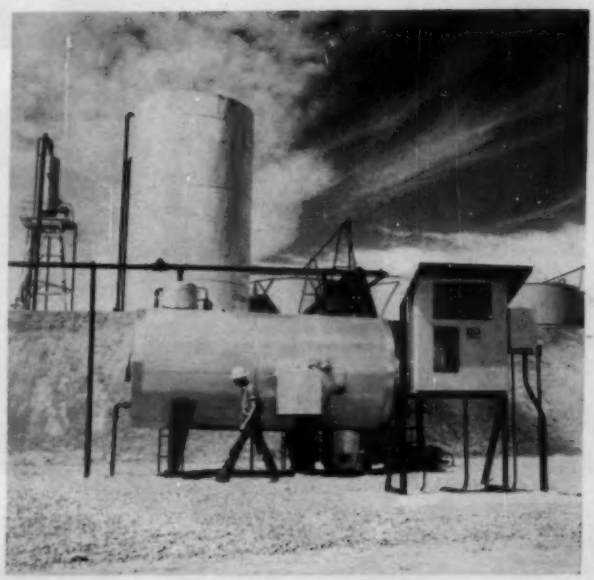


PHOSPHORIA produces from Cottonwood Creek's strat trap on the southwest flank of the Hidden Dome anticline.



LACT UNITS for ultimate use in the field are currently being tested by Pan American Petroleum Corp., unit operator.

where the porous section pinched out, preferably across a known structural nose.

The initial test drilled in 1953 proved the wisdom of the geological thinking. The well found 17 ft. of Phosphoria pay and was completed for an initial production of 100 bbl. per day. Subsequent development was rather slow since two followup wells were disappointing. However, these did not deter development of Cottonwood Creek, and today the field is producing 16,000 bbl. of oil daily.

It is too early yet to tell what the field will ultimately produce. However, some inkling as to the ultimate recovery is afforded by one 640-acre lease that has produced nearly 2,500 bbl. per acre to date and the four wells on the lease still rank among the best producers in the field.

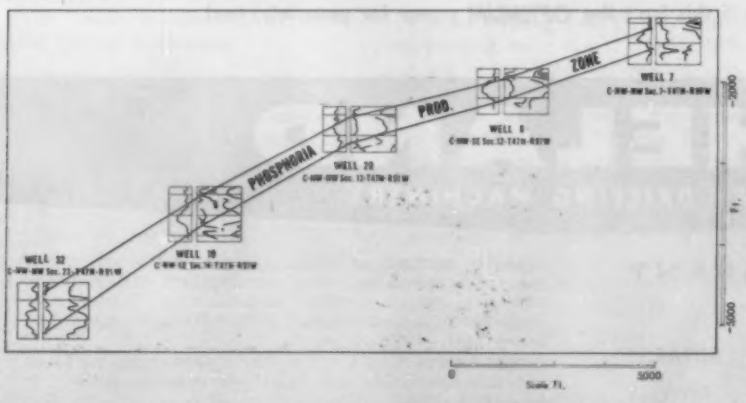
Geology . . . Cottonwood Creek lies on the southeast side of the Big Horn basin. The oil production actually occurs on the southwest flank of a positive feature, Hidden Dome anticline. The oil column has nearly 5,500 ft. of structural relief, based on the available subsurface data.

Within the field the porous Phosphoria limestone—the pay zone—averages approximately 30 ft. of thickness. Updip wells have encountered the "red facies" above the pinchout of the producing zone. The downdip oil-water contact, if one exists, has not yet been defined.

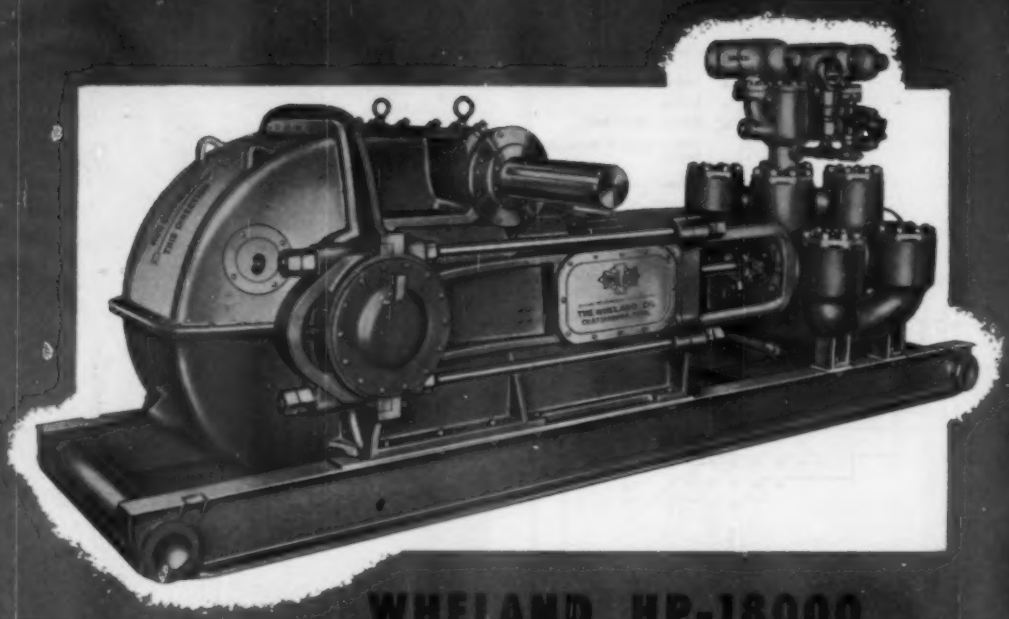
Tennessee Gas Transmission Co. completed its first well in 33-47n-91w as the structurally lowest producer in the field. This well had an initial potential of 83 bbl. per day and extends the field limits a mile and a half to the southwest. Recently Pan American Petroleum Corp. completed the No. 43 unit in 32-48n-91w that pushed the producing area 2 miles to the northwest.

Drilling and completing . . . Typical field wells are hard to find within the Cottonwood Creek unit since well depths vary from 4,500 to nearly 10,000 ft. However, the usual practice is to set surface pipe between 300 and 500 ft. and then drill through the pay zone. After setting the oil string and perforating, the operator will acidize the Phosphoria with treatments ranging from 5,000 to 10,000 gal. By now the drilling procedure has become routine with very few drilling problems. Normally a 9,000-ft. Phosphoria test can be drilled within 45 days or less. A completed flowing oil well costs $161,500 and a pumper $179,000.

Pan American Petroleum Corp., the unit operator, has already instituted a secondary recovery program at Cottonwood Creek. This program should increase substantially the total ultimate recovery from the field. At present compressors are pumping 13 M.M.c.f.d. back into the reservoir. The operator has designed the secondary recovery unit with an eye to expansion, but the facility now recovers 4,000 gal. of condensate and 10 long tons of sulfur per day.



UPDIP, the porous producing zone of the Phosphoria grades into a nonporous facies. Downdip wells have not yet established the oil-water contact.



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Drilling spurts in Southwest Texas

A SPLURGE of new wildcat drilling is getting started in Southwest Texas as a year-end show of activity. New exploration is widespread, stretching from Caldwell-Guadalupe County sector of the Balcones fault line southwestward along the "deep" Edwards and Wilcox trends through McMullen and LaSalle County into the upper reaches of far-southwest Webb County.

Gulf Oil Corp. is among the more active participants in the new surge of activity, much of it calling for deep drilling. Included in this company's new work are a deep exploratory test below the present productive horizons in the old Darst Creek Edwards field in Guadalupe County, and a deep Edwards wildcat in LaSalle County. The latter, contracted to Buzzini Drilling Co., of San Antonio, with a 11,000-ft. permit, is 4½ miles southeast of Los Angeles and about 5 miles northwest of Washburn, nearest Edwards field.

This company also is under way on a remote deep wildcat in the southwest corner of Dimmit County, near the Maverick and Webb county lines, in far-southwestern Texas. This test, permitted to 10,500 ft., is 40 to 45 miles southwest of the present most southwesterly deep Edwards field, in southwestern LaSalle County. Gulf also has on tap a deep wildcat in Laguna Madre, off Kenedy County, in the lower coastal region, a Wilcox exploratory test near Mirando City in western Webb County, a deep-pay wildcat in the old shallow Escobas field, Zapata County, and a 4,500-ft. wildcat west of Lockhart in Caldwell County.

Among the other deep wildcats starting is a 10,500-ft. deep Edwards test by Pan American Petroleum Co. in the remote northern part of Webb County, 12 miles northwest of Encinal. It is nearly 15 miles southwest of present most southwesterly field on the deep Edwards trend.

Included in the new key wildcats getting started are two by The Texas Co., in western Webb County; one permitted to 8,900 ft.; two 8,500-ft. tests in Hidalgo County, one by Tennessee Gas Transmission Co. southwest of McAllen, and the other by Claude Hamill near the one-well Retama field (7,700-ft. Frio sand); a 9,500-ft. Frio-Vicksburg test in the North Alazan area of Kleberg County; and a 9,900-ft. long stepout from the Yzaguirre field, 25 miles northwest of Mission in northeastern Starr County.

Who's getting the drilling contracts

Crow-Greyhound Drilling Co., Shreveport, has a rig working on a wildcat location 2 miles southwest of Harrisonburg, in Catahoula Parish, eastern Louisiana. It is a 5,000-ft. Wilcox test for H. A. Harper and R. H. Alagood, Shreveport operators. Location, at 1 Trichel, in 26-9n-6e, is about 3 miles northwest of Tew Lake field, nearest production.

Inland Drilling Co., Denver, has a new wildcat operation in southeastern Kit Carson County, eastern Colorado. It is a 5,700-ft. Arbuckle test for Creslenn Oil Co. at 1 Wilkens, in 6-10s-43w. Location is about 7 miles southeast of Burlington on the extreme southeastern flank of the Denver basin, near the Kansas line.

Carnes W. Weaver Drilling Co., Houston, has taken on two additional deep-drilling jobs for Texas National Petroleum Corp. in Acadia Parish, South Louisiana. One is a 12,000-ft. test about 1½ miles southeast of North Jennings field, on the Jefferson Davis line. The other is a 10,200-ft. test about midway between Grand Coulee and South Bayou Mallet fields. It is about 1½ miles from each.

Camay Drilling Co., Denver, has a rig working on a new 7,000-ft. drilling job in the West Table Rock area of Sweetwater County, Wyoming. Drilling is for St. Helens Petroleum Co. Location, in 34-19n-98w, is 1½ miles west of production. It is a Mesaverde test.

Meadows & Walker Drilling Co., Houston, has a new deep-drilling job in the Madisonville area of southern Madison County, southeastern Texas. Woodley Petroleum Co., the operator, has permit for a 9,600-ft. test. Location, at 1 Coleman in the Amy Boatwright Survey, is 5 miles southwest of Madisonville.

Butler-Johnson, Inc., Shreveport, is drilling for Kinsey & Kinsey, Shreveport operators, on a wildcat location 4 miles northwest of Crichton, in Red River Parish, North Louisiana. Contract calls for a 6,500-ft. test at 1 Calvert et al., in 9-13n-11w. Location is 1½ miles from production in Bull Bayou field.

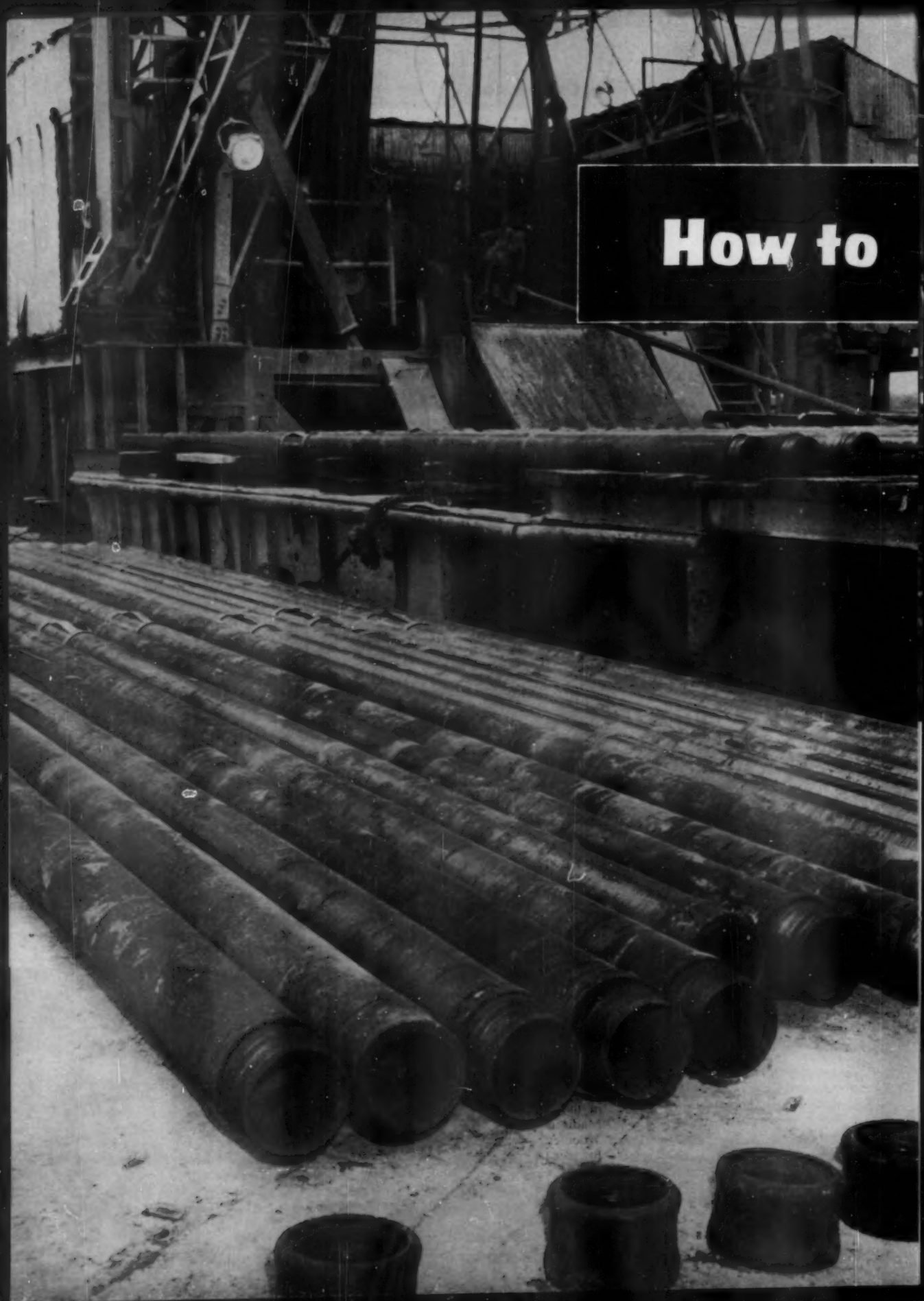
Penrod Drilling Co., Dallas, is Pan American Petroleum Corp.'s contractor on a newly started 9,600-ft. drilling operation in the Carlton area of Ouachita Parish, North Louisiana. Pan American's location, at 1 Coon, in 16-18n-1e, is about a mile from the nearest production. Pay is in the Cotton Valley section.

Pioneer Drilling Co., Casper, Wyo., will drill Tennessee Gas Transmission Co.'s second test in the new exploratory play in the remote far-northwestern sector of the Paradox basin, in southeastern Utah. The new test, 1-A USA-Sorrel Butte, in southern Wayne County, is 7 miles north of Tennessee's other test, on which **Willard Peace** is the contractor. The latter, 1-A USA Poison Springs, in Garfield County, was drilled to 6,491 ft. and operators now are attempting to complete it as a Devonian discovery well. Pioneer's test also is a Devonian test with depth objective of 6,800 ft.

Simpson & Harris Drilling Co., Bakersfield, Calif., is drilling on a new 7,200-ft. exploratory test northwest of production in the Oxnard area, Ventura County, southern California. It is a contract job for Cabeen Exploration Co. with location at 1 Hunter-Power, in 31-2n-21w.

Western Offshore Drilling & Exploration Co., Los Angeles, is getting started on a stratigraphic drilling program it has contracted to do for Phillips Petroleum Co., group operator, on a recently awarded state tidelands lease offshore from Santa Barbara County, California. Drilling is from a floating barge. First test is 9,000 ft. offshore and about 3 miles west of shore-located Elwood field. Western Offshore is the marine-drilling subsidiary of Haney & Williams Drilling Co.

Longhorn Drilling Corp.'s newest deep-drilling operation for Westland Oil Development Corp. in the Stuart City area of southwestern LaSalle County, Southwest Texas, is at a long stepout location southwest of production. It is Westland's third well for the area, gas-productive from Edwards lime below 10,000 ft.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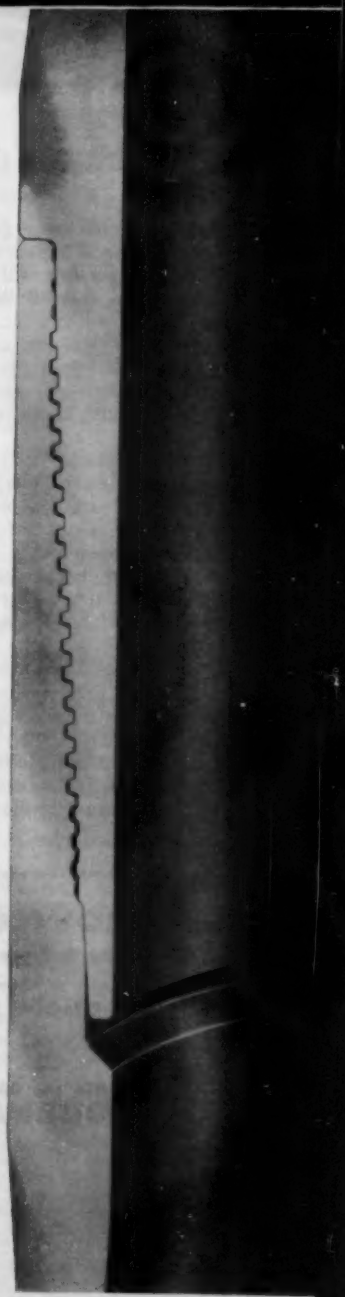
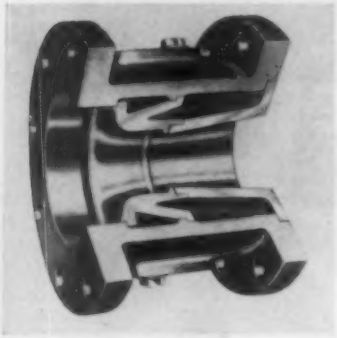


Extreme Line Joint.

▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .



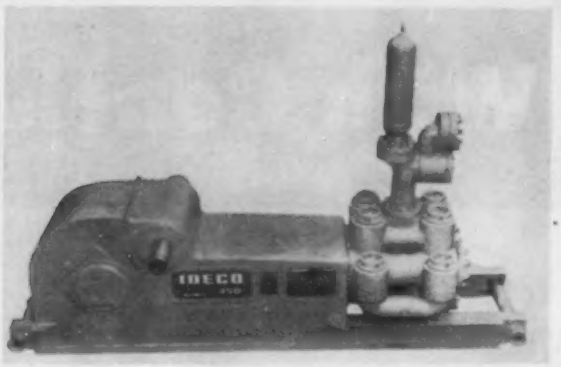
Twin-throat venturi for measuring

. . . water, air and other gases developed to achieve a higher differential pressure than possible with the older type of venturi tube. Built in a size range of 4 to 48 in., the venturi is relatively lightweight and easy to handle and install. For a given line diameter, the throat-area ratio may be converted without changing the connecting piping.

The venturi is made of high-tensile-strength gray iron with bronze throat inserts. But it can be obtained of cast steel and alloys for high pressure and corrosive fluids.

Accuracy of uncalibrated twin-throat venturi tubes is ±2%. Specially calibrated tubes have an accuracy of ±0.5%.

An advantage cited for the twin-throat venturi tube is that it has as low a head loss for a comparable laying length as any known velocity-increasing differential producer. **Write or call: Infilco, Inc., Tucson, for details on twin-throat venturi.**



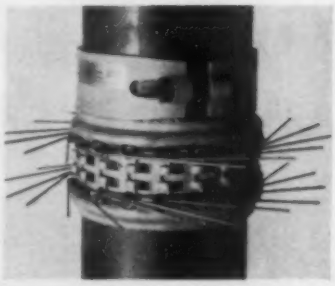
Duplex slush pump for slim-hole

. . . or medium-depth drilling is rated at 450-hp. input and weighs less than 20,000 lb. The MM-450 pump employs all-steel construction and is designed for high plunger loads and high operating speeds.

The pump is said to be easy to handle and provides working pressures up to 3,000 psi. It delivers mud volumes of almost 700 g.p.m. On large rigs, it can be used as a second or third pump because of its high-pressure capability.

The fluid end is one-piece cast steel and hydrostatically tested to 6,000 psi. on the discharge side and 3,000 psi. on the suction side. Two-piece threaded valve-pot covers are used. They can be quickly removed.

The valves have a "fluid-cushion" seal ring to reduce shock loading of the valve on the seat. The seal rings are oil resistant and can be reversed for extra life without removing the seat from the pump. A dual-chamber pulsation dampener is optional. **Write or call: Ideco, Inc., P. O. Box 1331, Dallas 21, for details on MM-450 slush pump.**



Friction-lock clamp holds scratcher

. . . in place on the casing. The fixed scratcher can be useful to remove mud cake from well walls and to assure proper circulation during cementing operations on a well. The combination unit is slipped over the casing to a selected position and the friction-lock clamp tightened with a power impact or hex wrench.

The maker reports that numerous tests have proved that there is no more deformation of the fixed scratchers on removal than with the floating type. One advantage of the friction-lock clamp type of scratcher is that it eliminates welding on casing for holding the scratcher in place which can be injurious to the casing. **Write or call: B and W, Inc., P. O. Box 5266, Houston 12, for details on friction-lock-clamped scratcher.**

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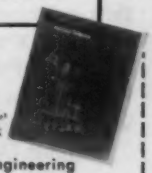

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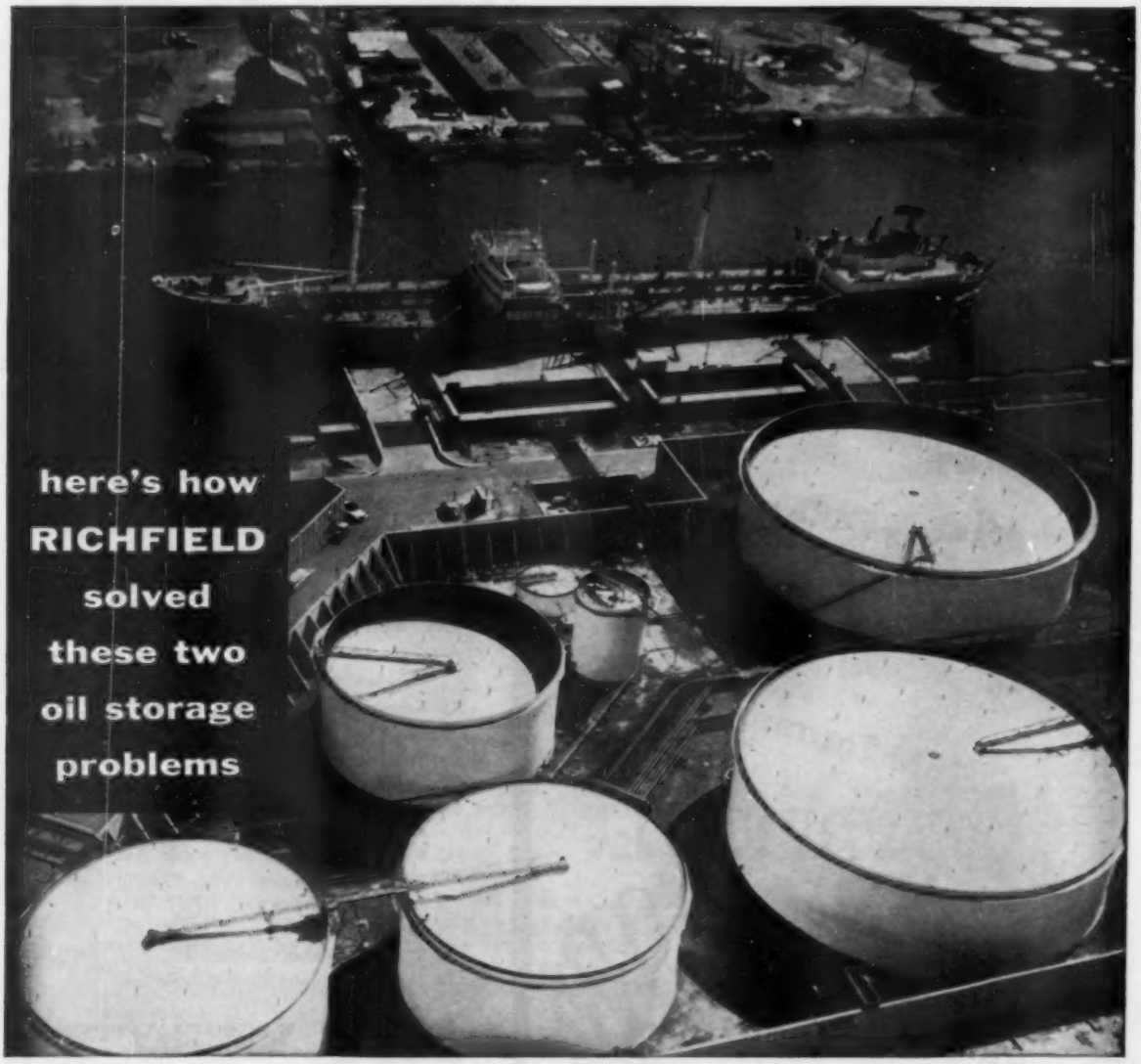

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Here is an investment by Richfield Oil Company that pays off in safety and conservation. It is a seven-tank addition to Richfield's Marine Terminals that adds half a million barrels capacity. The tanks, built by General American, are equipped with Wiggins Floating Roofs with Wiggins Safety Seal that stops vapor loss and protects from rim fires.

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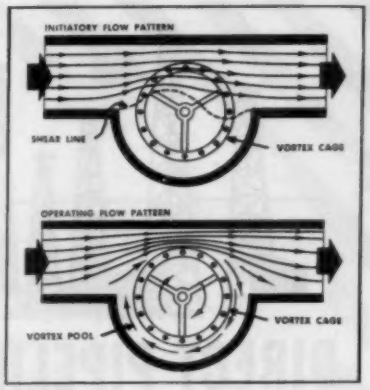

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It will also successfully handle such nonlubricating fluids as LP gas, dry fuel gas, and water. The Model A5Y meter is a 20-in. size. Accuracy is ±½% with no periodic recalibrations.

The flowmeter is equipped with an integral dry calibrator. By means of a screw driver, the reading may be increased or decreased in the field and during operation by about ±1%. This allows recalibration to agree with prover equipment.

The meter consists essentially of a straight-through conduit with only one moving part, a lightweight squirrel-cage rotor which turns freely in the fluid and rests on two bearings. An output driving magnet attaches to one end of the shaft. Inertia of the rotor is so low that it gives virtually instantaneous response. Pressure drop across the meter ranges from about 0.1 psi. at 23 g.p.m. to about 7½ psi. at 200 g.p.m. of water. **Write or call: Rotron Controls Corp., Woodstock, N. Y., for Bulletin CM-10.**

Instrument collects data, controls

. . . 100 locations. The instrument is the Data-Gage, previously developed for fluid-level data collecting. It is composed of a receiver located at a central point, a field-selector unit that can read and control 100 locations or be cascaded to control 1,000 locations, a common analog input unit for all analog output transducers, and the needed transducers and control elements. Applications include oil production, refining, and petrochemical manufacture. **Write or call: Texas Instruments, Inc., P. O. Box 6027, Houston 6, for details on Data Gage.**

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Compound seals casing joints tightly

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The maker reports that torque tests were made on 5½-in. casing joints welded with six, ¾-in. welds and with clean joints locked with the compound. The welded joints broke out at torques ranging from 17,000 to 20,000-lb.-ft. while the joints locked with the compound broke out at substantially higher torques, even under temperatures from 50° to 400° F. **Write or call: Baker Oil Tools, Inc., Box 2274, Terminal Annex, Los Angeles 54, for details on Bakerlok.**

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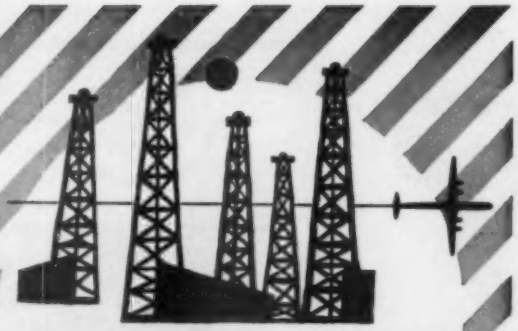

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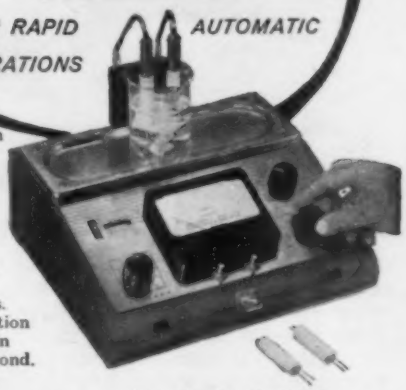

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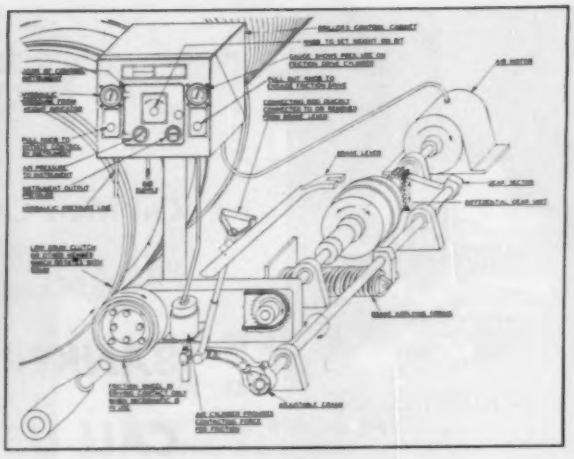


plus control cabinet in . . .

New drilling control will keep preset weight on bit

IT IS applicable to almost every draw works, regardless of size. Installation takes only about 6 hours. Only minor alterations to the draw works are needed. These can be done in the field.

Once the control is installed, it becomes an integral part of the draw works. It need not be removed when the rig is moved.

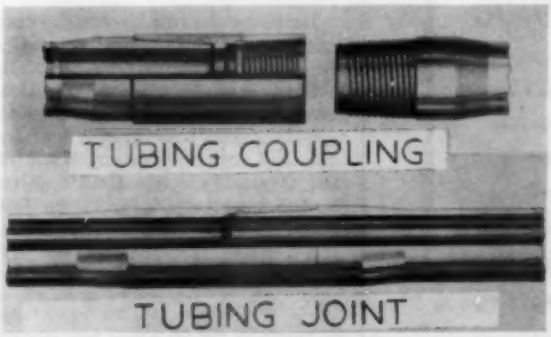
Essentially, the control is a speed-governing device. It responds to a weight signal from the dead line. By keeping a predetermined weight on the bit, it relieves the driller of much physical effort and the need for constant attention.

With rotary speed and mud calculation held constant and for a given weight on a bit, the penetration rate depends upon the hardness of the formation and the condition of the bit.

In drilling with the control, the driller first obtains the desired amount of weight on the bit. He then snaps and locks the connecting rod to the brake lever. This links it to a spring. The driller next opens two air valves in the control cabinet. The drilling control then takes over the drilling operation and maintains the desired weight on the bit.

The driller can change the bit weight any time by adjusting an air control. Or he can disengage the control quickly when necessary. All controls are in easy reach. The control has been tested in drilling both straight and directional holes. **Write or call: National Supply Co., Two Gateway Center, Pittsburgh, Pa., for details on Model 6 Micromatic drilling control.**

●



New tubing joint for deep wells

. . . permits production tubing strings to have connections with high yield strength, rugged thread forms, positive metal-to-metal thread seal, and a compressed soft seal without excessive pipe upset. Allowing fast makeup of connections, the joint is designed to withstand a greater amount of internal pressure than the nominal body of the tube.

The dual-seal coupling joint has a modified truncated buttress thread form that is rugged and holds under all conditions of tension, the maker reports. It makes a metal-to-metal seal on the thread shoulders and leaves the crests unengaged. A Teflon soft seal in the lower end of the box recieves full compression against the nose of the pin and the base of the coupling box by a one-half turn of the connection after it is handtight. **Write or call: Hardy-Griffin Engineering Corp., 14522 South Main Street, Houston, for details on Dual Seal tubing joint.**

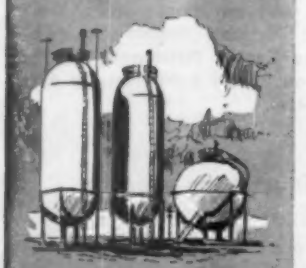
Aluminum caps used on stabilizer ribs

. . . to overcome the problem often occurring with rubber ribs when drilling shale formations, that of becoming cut or torn from the steel bushing. The stabilizer is a rubber-sleeve type. It has the same steel bushing and rubber bearing as conventional rubber-rib sleeves. The aluminum replaces the rubber ribs that contact the hole wall.

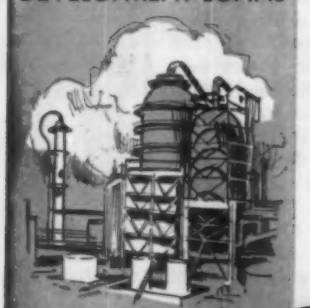
The aluminum ribs have given much better service when drilling shale formations than have rubber ribs. Aluminum has physical and strength properties good enough to resist the abuse the sleeves must take in normal use. Still, it is soft enough to be easily drilled by a washover shoe or rock bit. **Write or call: Drilco Oil Tools, Inc., Midland, Tex., for details on Aluminum-ribbed drill-collar stabilizer.**

INDUSTRY LOANS

PRODUCTION LOANS



DEVELOPMENT LOANS



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BANKERS CALL US "OIL MEN"!!!

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A. D. McCALL—Engineer

IN OIL MATTERS — *IT PAYS TO* . . .

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FIRST NATIONAL BANK & TRUST CO.

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SHOWCASE . . .

New Literature

Liquid-solid cyclone bibliography

. . . compiled by minerals beneficiation specialists is now available. The bibliography lists 243 articles on the liquid-solid cyclone which were published from 1939 through 1957, with some early 1958 entries included. It includes articles on the theory and design of this equipment and on its use in mineral processing, petroleum, and chemical industries. A general catalog of entries includes references to review articles, books, bibliographies, and articles general in nature. **Write or call: Publications Office, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio, for Liquid-Solid Cyclone Bibliography.**

Check-valve price folder

. . . which gives both factory and stock prices on various weight and size valves is now obtainable in 10 pages. Thirty-eight charts show the steel, semisteel, and bronze-aluminum check-valve prices. The folder includes construction features, accessories, and photos. **Write or call: Frank Wheatley Pump & Valve Mfgr., P. O. Box 1948, Tulsa, for Check-Valve Price Folder.**

Variable-measuring instruments

. . . including recorders, recording controllers, and indicators are outlined in new 12-page Bulletin GEA-6792. It contains application data, specifications, and outline and mounting dimensions. The bulletin also includes photos of the equipment. **Write or call: General Electric Co., 1 River Road, Schenectady 5, N. Y., for Bulletin GEA-6792.**

Stainless-steel exchangers

. . . for production and pilot-plant applications of the chemical and process industries are detailed in new four-page Bulletin 301-6K1. The bulletin gives details on features designed to assure maximum-heat transfer, plus specifications on 19 models available in one, two, and four-pass designs. **Write or call: Ross Heat Exchanger Div., American Standard Products, Buffalo 5, N. Y., for Bulletin 301-6K1.**

New thermocouples

. . . for use in industrial and process fields are described in new Bulletin 3.8A. Trade-named AerOpak, the thermocouples have a temperature range

of from 400° to 2,000° F. and are pressure-tight to 50,000 psig., the maker claims. The bulletin contains data, charts, and pictures. It specifies a choice of diameters, materials, typical connectors, junctions, and terminations. **Write or call: Aero Research Instrument Co., 315 North Aberdeen Street, Chicago 7, for Bulletin 3.8A.**

Continuous-stream analyzers

. . . are detailed in new eight-page, two-color Bulletin CL-4000. Equipment described includes gas chromatographs, infrared and oxygen analyzers, electrolytic hygrometers, and flow colorimeters. The bulletin also includes photos, drawings, and applications. **Write or call: Beckman Instruments, Inc., Scientific & Process Instruments Div., 2500 Fullerton Road, Fullerton, Calif., for Bulletin CL-4000.**

Instrument drive and timing unit

. . . that's air or gas-powered and completely self-contained is described in new Bulletin 410. Known as Gasclok Power Drive, the unit is suited as either original or replacement equipment with all makes of recording instruments. It is also said to supply a power output of more than 20 times the torque delivered by conventional spring-wound clock mechanisms. The bulletin gives complete specifications and application details. **Write or call: American Meter Co., 920 Payne Avenue, Erie, Pa., for Bulletin 410.**

New synthetic rubber

. . . known as Viton is fully illustrated in a new 12-page brochure. Viton is serviceable in temperatures over 400° F. in oils, fuels, and solvents. The brochure points out Viton's properties, applications, and commercial status and illustrates with photos. A two-page color chart shows the effects of fluids and chemicals on Viton after the material was immersed in them for 7 days. **Write or call: E. I. du Pont de Nemours & Co., Inc., 1007 Market Street, Wilmington 98, Del., for Viton Brochure.**

Automatic controls for engines

. . . and compressors are detailed in new 12-page Bulletin 87. It describes equipment for automatically starting, loading, controlling, regulating, and shutting down pipeline compressors. The equipment also applies to other types of power machinery such as gas and diesel engines, as well as motor-driven reciprocating and centrifugal compressors commonly used for gas-processing and air services, according

Any way you look at it . . .

there's no substitute for liner hardness

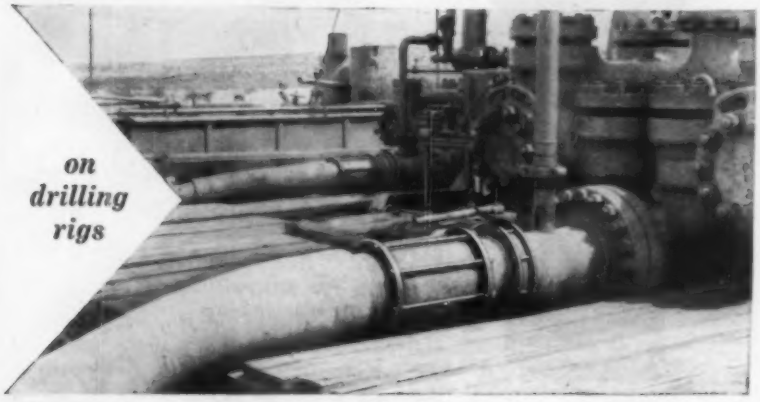
Harrisburg pump liners are the star performers in the oil fields . . . because they are Diamond Hard. They are precision manufactured from billet to mirror-finished liner. In test after test, Harrisburg liners last longer under all operating conditions . . . because there's no substitute for Harrisburg liner hardness.

HARRISBURG, INC.

OIL FIELD SALES AND SERVICE

P. O. BOX 334 FORT WORTH 1, TEXAS

Dresser® Couplings—



fast, vibration proof...

safe, permanent joints!

Dresser Couplings are easily installed . . . only two man-minutes per bolt with a simple hand wrench. The specially compounded Dresser Gasket provides the essential "give and take" to absorb vibration, settlement, and other stresses that might cause damage. It also allows up to 4° pipe deflection at every joint and still maintains a permanent, bottle-tight seal. Eases of take-down and re-usability of Dresser Couplings are a tremendous asset where you may need to add new pumps, valves or lines. Send for Dresser Catalog No. 531. It contains more detailed information and complete specifications on *all* Dresser Couplings, Fittings and Pipe Repair Products.

• GET THEM FROM YOUR LOCAL OIL FIELD SUPPLY STORE

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to the bulletin. **Write or call: Cooper-Bessemer Corp., Box 751, Mount Vernon, Ohio, for Bulletin 87.**

Engines, power plants, generators

. . . for oil-field use are described in new 20-page Bulletin 106. The bulletin gives performance characteristics of 26 engine models. The engines offer a range of 200 to 2,150 b.hp. and 150 to 1,500 kv., naturally aspirated or supercharged and operated on natural gas, diesel, or dual-fuel. The bulletin includes photos, cutaway and dimensional drawings, graphs, and specification tables for ready reference. **Write or call: Dept. 712, White Diesel Engine division of White Motor Co., 1401 Sheridan Avenue, Springfield, Ohio, for Bulletin 106.**

Tenite plastics quality-control tests

. . . and their results are discussed in a new 20-page booklet. It explains how the plastics—butyrate, propionate, acetate, and polyethylene—react to rigorous tests for flow, stiffness, hardness, heat-resistance, inherent viscosity, color, haze, transparency, and other physical and chemical properties. The booklet includes numerous photos both in color and in black and white. **Write or call: Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., Kingsport, Tenn., for Tenite Quality-Control Booklet.**

New spectrophotometer

. . . known as KBr Model 137 Infracord, is detailed in a four-page bulletin. The Infracord is a double-beam infrared instrument designed for analysis in the infrared spectral region from 12.5 to 25 mμ. The bulletin describes the operation, accessories, and specifications of the Infracord. It also contains spectra which show the instrument performance. **Write or call: Perkin-Elmer Corp., Instrument Div., Norwalk, Conn., for KBr Model 137 Infracord Spectrophotometer Brochure.**

Laboratory rotameters

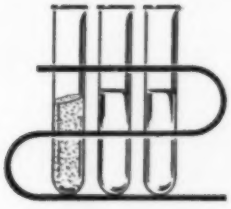
. . . for measuring fluid rate of flow, are detailed in new Bulletin 18L. Flexible connections are provided on the rotameters for quick, easy installation in plastic, glass, or metal piping for sizes from ¼ through 2-in. The rotameters are applicable to both liquids and gases. Two types of metal tubes are described in the bulletin—a high-capacity fluted and a conical-tapered. **Write or call: Schutte & Koerting Co., Dept. MJ, Cornwells Heights, Bucks County, Penn., for Bulletin 18L.**

Making your own oil and gasoline additives ?

Monsanto Phosphorus Inorganic Intermediates give you big benefits in additive performance

FOR OIL ADDITIVES:

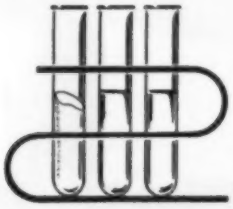
PHOSPHORUS PENTASULFIDE AND OTHER PHOSPHORUS INORGANIC INTERMEDIATES *are converted to derivatives which...*



1. Serve to inhibit corrosion and oxidation
2. Help prevent formation of varnish, lacquer and sludge on internal combustion engines
3. Impart a detergent action that retards ring sticking

FOR GASOLINE ADDITIVES:

PHOSPHORUS TRICHLORIDE, PHOSPHORUS OXYCHLORIDE AND PHOSPHORUS PENTOXIDE *are used in compounds which . . .*



1. Help reduce deposits on combustion chamber walls
2. Make combustion chamber deposits less conductive—less likely to hold heat and glow
3. Help prevent fuel pre-ignition, improve spark plug performance

MONSANTO Phosphorus Inorganic Intermediates are also used in grease additives, quenching-oil additives, motor-oil reclaiming compounds, machining lubricants and surface coatings for machine parts.

FOR RAW MATERIALS for production of additives, contact Monsanto to get what you want in quantity, quality and delivery.

For further information, call or write Monsanto —your *big benefits* source of phosphorus inorganic intermediates—for technical bulletin I-35, "Phos. Trichloride and Phos. Oxychloride," and/or technical bulletin I-159 "Phos. Pentasulfide."

MONSANTO CHEMICAL COMPANY
Inorganic Chemicals Division
St. Louis 24, Missouri

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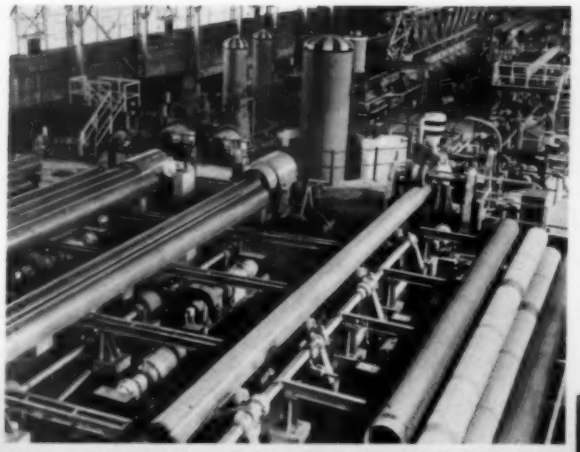
There's no better pipe than

More and more pipe buyers are simplifying and speeding up line jobs by specifying Youngstown Electric Weld. It possesses excellent line up characteristics, welds easily and its long lengths save time and trouble. For more information about Youngstown Electric Weld Line Pipe contact our sales and service offices throughout the oil and gas-producing country.

The Youngstown Sheet and Tube Company,
Youngstown 1, Ohio.

Youngstown in any line!

All Youngstown Electric Weld Line Pipe, 12¾" and larger, is full-length hydrostatically expanded to more uniform roundness. In this operation, internal water pressure forces the pipe out against the solid walls of a mantle. This increases its strength and enlarges the diameter . . . both of which make line up and welding a far easier job in the field. Final proof tests such as these are reasons why there's no better pipe than Youngstown on any line!



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Youngstown

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THIS MAN'S A SPECIALIST IN PROTECTING YOUR PROFITS. His title is Dowell Service Engineer. His job—to study your maintenance cleaning problems, recommend the proper solutions and apply chemical solvents to help you make more profit. He represents a team of specialists who have rendered old-fashioned all other methods of cleaning product, process and steam generating equipment. His method is Dowell Service, the modern way—using solvents—to remove scale and sludge from all kinds of metal equipment, tanks, piping and lines.

Specifically: one processor had been performing his own turnaround service—using mechanical methods—at an annual cost of $315,000. The Dowell Service Engineer and his team performed the same service in 1/10 of the time at a cost of $2300. The savings in downtime alone amounted to $210,000.

If your maintenance and operating engineers do not know the profit possibilities with Dowell Service, ask them to get the facts for you. For specific information on how chemical cleaning can help your plant to greater profits, call the Dowell office nearest you. DOWELL—A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma, with 165 offices and stations to serve you.

chemical cleaning services for industry DOWELL

Los Angeles Nomads host international guests

... at the November meeting. Standing are: J. L. Mathieu, Schlumberger Overseas, France; A. Cendre, A. C. M., France; Al Dysart, International Brown, Turkey; Ray Conger, International Brown, going to Guatemala; L. E. Miles, Santa Fe Drilling, Iran; Khalil Khalili, Iran Oil Co., Iran; John Schauweker, Santa Fe Drilling; Leon Duane, Petro Mara, Venezuela; and W. H. May, Santa Fe Drilling, going to Guatemala. Seated are: A. R. Little, D & E, Nigeria; Bill Lance, Santa Fe Drilling, Burma; A. E. Patterson, Los Angeles Dodgers, speaker; and V. E. Clayton, Iraq Petroleum Co., Iraq.

Brewster names new officers

H. B. Marioneaux

Harry B. Marioneaux has been elected president and general manager of Brewster Co., Inc., according to Mrs. H. C. Brewster, chairman of the board. In other key executive appointments, Bill Pickering was moved to assistant to the president and sales manager, and John L. Morgan was named vice

Bill Pickering

J. L. Morgan

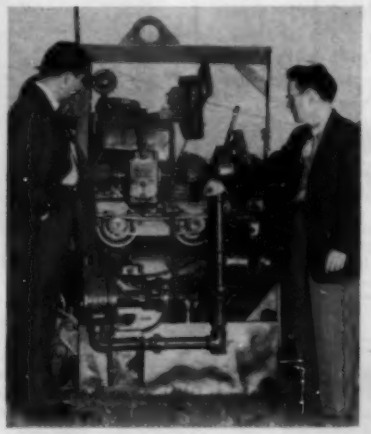
president and director of sales. Marioneaux has been with Brewster for nearly 15 years. Pickering joined the company 4 years ago. Morgan will also serve on Brewster's board of directors.

Ladish Co. names H. L. Pehrson

... as general sales manager of the Ladish Pacific division in Los Angeles. For the past 11 years he has served Ladish as manager of West Coast sales. In his new capacity he will also direct marketing of Ladish drop forgings, rolled rings, corrosion resistant valves, and industrial pumps.

Ben Brooks appointed

... city representative at El Paso, Tex., for U. S. Steel Corp.'s Oil Well Supply Division, reports William Miskimins, Central Midwest area manager. Brooks was employed by Oilwell in 1948. He left the division in 1955, rejoining in 1956 at Hobbs, N. M. He was located in Hobbs prior to his present appointment.



Venezuelan contractor visits

... M. J. Crose Manufacturing Co., Inc. Aldo Formiconi, Venezuela, discusses pipeline construction equipment with John Manley, export sales manager for Crose. Formiconi heads his own company which is currently laying 16-in. pipe for gas lines in the vicinity of Cardon and Amuay, Venezuela.

Lee Thomas promoted

Lee Thomas

... from Mid-Continent division sales manager to division sales manager of the southern division of Eastman Oil Well Survey Co., reports H. John Eastman, president. Thomas has held sales positions with Eastman in Odessa, Tex.; Casper, Wyo.; Long Beach and Bakersfield, Calif.; and Denver, Colo.

Mission Manufacturing makes

Tony Volotko

Harold Herrin

... seven new appointments and reassignments in its oil field sales and service divisions. In the service field,

Joe Scalise

R. E. Hardy

Tony Volotko was named service engineer at the Houston office of Mission Manufacturing Co. He was a field sales representative there. Moving to

A. E. Robinson

R. M. Wood

New Iberia, La., from Houma as field sales representative is Harold Herrin, formerly service engineer in Houma. Joe Scalise was reassigned from New Iberia to Houston as a field salesman. Appointed city sales representative

for the Dallas-Fort Worth area with headquarters in Dallas is R. E. Hardy.

Joe Young

A. E. Robinson transfers from Abilene to New Orleans, and R. M. Wood shifts from Illinois to Oklahoma City. Replacing Wood in Illinois as field sales representative for the Tri-state area is Joe Young who formerly was in Oklahoma City.

Warren Hollier promoted

. . . from manager of services in the Rocky Mountain division to division manager of Houston Oil Field Material Co. He will have charge of both sales and services and will headquarter in Casper, Wyo. He has been with Homco for 11 years.

Wilson-Snyder Works stations

. . . its own district sales engineers in six strategically located offices of Oil Well Supply Division, according to N. E. Meyer, manager of sales of Wilson-Snyder. These offices are in New York, Chicago, Tulsa, Houston, Los Angeles, and Braddock, Pa. The sales engineers representing Wilson-Snyder have had wide experience in the selection and application of its line of centrifugal and reciprocating pumps.

These IPE Nomads plan international party

. . . to be held during the International Petroleum Exposition, May 14 through 23, 1959. Don Collins, Republic Supply Co., IPE Nomand chairman, says that party attendance will reach 4,000. At the committee meeting are: Standing R. C. Glover, Baker Oil Tools, Inc.; Gilbert Swift, Well Surveys, Inc.; and S. J. Raphel, IPE housing manager. Seated are: Kenneth O. Hoevel, National Supply Co.; George W. Davidson, Jr., W. C. Norris, Division of Dover Corp.; John Pearce, Superior Iron Works & Supply Co., Inc.; E. L. Thomas, executive secretary, Tulsa Nomads; and Collins.

Cooper-Bessemer Corp. assigns

. . . Sven T. G. Swanberg to the New York field office, reports Grant C. Woodard, general sales manager. In his new position Swanberg will assist in engineering and sales relative to the application of centrifugal and reciprocating compressors for chemical and processing industries. In this ca-

"Are you positively absolutely certain it reads 'the NW/4 of the SE/4 and not the SE/4 of the NW/4'?"

THE OIL AND GAS JOURNAL

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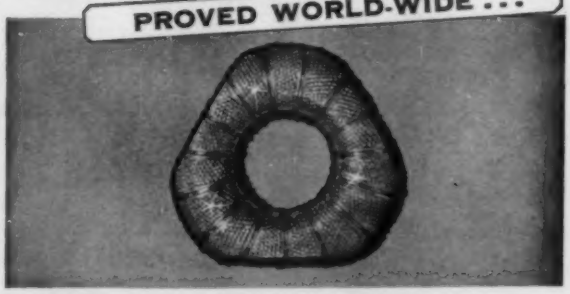
PROVED WORLD-WIDE . . .



D&S TRUCO Tri-Dia JET ACTION Bits!

Mid-Continent area, Rocky Mountains, the Middle East, Permian Basin, Brazil, Gulf Coast area, Venezuela and Canada . . . D&S Tri-Dia Jet Bits have set unequaled highs in drilling for less in every major oil area, because each bit is carefully engineered to fit individual conditions. (1) Volume circulated, (2) type mud, (3) formation.

WRITE TODAY! One of our sales engineers will call on you and explain this revolutionary Tri-Dia Diamond Bit.

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OFFICES IN ALL PRINCIPAL OIL AREAS

Ultra Fine Diamond Equipment for the Oilfield

pacity he will work under the immediate direction of C. J. Havekotte, New York branch manager.

Welex, Inc., promotes three

G. K. Harcourt

. . . to the newly created post of assistant to the vice president of sales. In Houston are G. K. Harcourt, former special salesman at Tulsa, and J. W. Lyon, former division sales manager at Houston. Promoted to the same position in Tulsa is R. B. Burns, former Tulsa division sales manager. Harcourt has been with Welex for 1 year. Lyon has been with the company since December 1955. Burns has been with Welex for the past 9 years.

J. W. Lyon

R. B. Burns

Bovaird Supply Co. promotes

. . . Ralph Enloe, Shreveport, La., to district manager of operations in the new district which includes Louisiana, southern Arkansas, Mississippi, and Alabama. Malcomb L. Sutton has been promoted from field salesman to manager of the Shreveport store. Both Enloe and Sutton have long experience in the oil-field supply business.

Ralph Enloe

M. L. Sutton

Two Houston companies form

. . . a new international geophysical contracting survey company. Burton McCollum, president of McCollum Exploration Co., and Robert H. Ray, president of Robert H. Ray Geophysical Co., combine talents to form McCollum-Ray International. Inc. Ray will be president and McCollum will be chairman of the board of directors. The individual McCollum and Ray organizations will continue independently to serve the industry in their present capacities.

Burton McCollum

R. H. Ray

Do you need . . .

AIR DRILLING EQUIPMENT?

We have the know-how through experience and have Le Roi proven Air Drilling Equipment to meet most requirements—any capacity—pressures up to 1500#—Rental with option of purchase—Sales.

Write or phone, we will gladly arrange for a meeting at your convenience.

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Industrial THERMOMETERS

Flat Bore—Mercury Filled—Engraved Stem—with 18-8 stainless steel stems. Chromium-plated case to resist corrosion and dirt. These midget industrial thermometers are recommended for equipment requiring Small Armored thermometers . . . and where large industrial thermometers are inappropriate.

An economical instrument . . . because thermometers may be replaced "on the job" . . . that is—refill can be inserted into Armored Case without difficulty . . . eliminates necessity of sending instrument to factory for thermometer replacement. Assured Accuracy.

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Warning to all oilmen!

YOUR BIGGEST COMPETITOR— THE GASOLINE TAX— IS READY TO STRIKE AGAIN!

As every oilman knows, gasoline taxes are your biggest competitor for the American motorist's gasoline dollar.

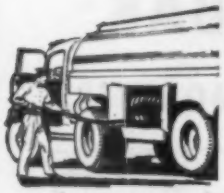
Now, according to reports from Washington, Congress will be asked to raise the federal gasoline tax again—by as much as *2¢ on every gallon!*

TODAY: The American motorist pays federal and state gasoline taxes* equal to:

41% of the retail price on every gallon

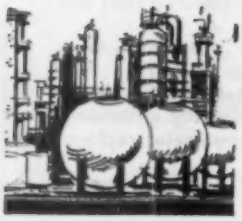
54% of the tank wagon price on every gallon

80% of the refinery price on every gallon



TOMORROW: If this tax increase is allowed to go into effect, the American motorist will pay federal and state gasoline taxes* equal to:

50% of the retail price on every gallon



66% of the tank wagon price on every gallon

97% of the refinery price on every gallon

*Combined national average of state and federal gasoline taxes.

WHAT DO YOU THINK THE AMERICAN PEOPLE WILL SAY ABOUT THIS? CAN THEY AFFORD IT? WILL THEY BLAME YOU?

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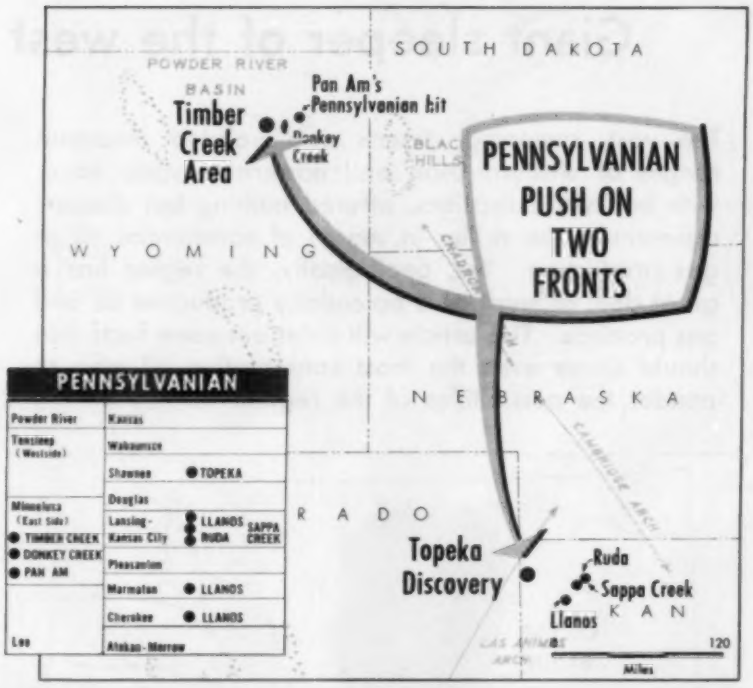


DARING Pennsylvanian exploration in northwestern Kansas and northeastern Wyoming highlights year-end activity in the western Great Plains.

1959 headline makers . . .

Wyoming's Powder River basin and Kansas' Las Animas arch

BY JOHN C. McCASLIN

EACH EXPLORATORY year has its new oil and gas provinces . . . 1958 is no exception. Two of the country's hottest virgin oil-hunting areas are the northeastern Powder River basin in Wyoming and the northeastern reaches of the Las Animas arch in northwestern Kansas. The big trek in these two areas is to the Pennsylvanian rocks.

A new era . . . The big wildcat story in the Rocky Mountains for the past 3 years has been the opening of prolific oil reservoirs in Pennsylvanian rocks. These rocks were taken for granted until Utah's Paradox basin was cracked with its huge storehouse of Pennsylvanian oil. In Wyoming the Tensleep has always been a big source of oil. But last year first Pennsylvanian production was tapped in the northeastern part of the Powder River basin, where only the Cretaceous had held sway. Development was slow, but in the past month two highly important Pennsylvanian-Minnelusa discoveries bowed in.

. . . In Wyoming. The trend toward deeper rocks in the northeastern Powder River basin is well on its way. True Oil Co. recovered oil on test of the Minnelusa at its Timber Creek wildcat in Campbell County at 9,349½-9,400 ft., opening a new pool 10½ miles west of Donkey Creek (the first Pennsylvanian strike in this region). Pan American Petroleum Corp. a few days earlier found oil in the Minnelusa at its 1 Robinson wildcat 6 miles east of Donkey Creek. Recoveries at both wells were good. Look for a spirited frontal attack on Pennsylvanian rocks in the coming months in Powder River.

. . . In Kansas. The Pennsylvanian situation in northwestern Kansas is a bit different from that of Powder River. Prior to Phillips Petroleum Co.'s Llanos field discovery a few months back, there was **no** production of any kind in the northwestern counties. An entire new oil province has been born in these northwest counties . . . Sherman, Cheyenne, and Rawlins. For half a dozen years wildcatters have probed up and down the length of the Las Animas arch. The reward has been disappointing—until Llanos. This multipay field is the most important discovery in Kansas since pre-Permian strikes began to dot Hugoton gas field, and to make a breakthrough in geological thinking. Then came Ruda and Sappa Creek and the rush was on.

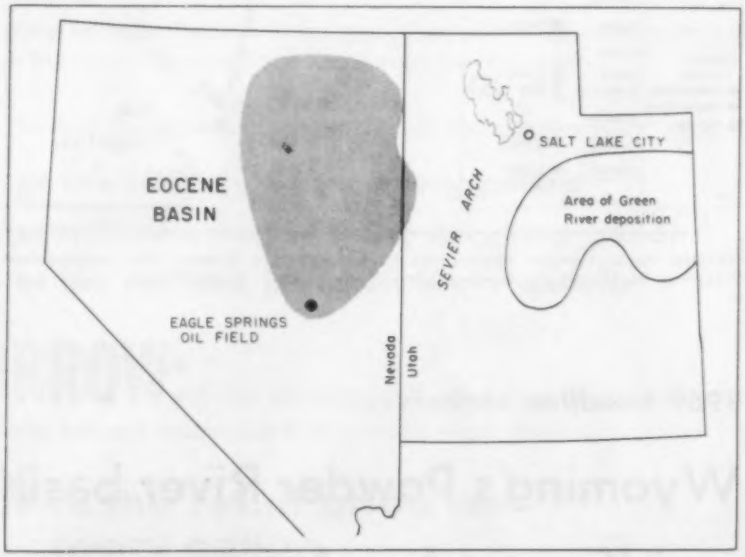
The latest Pennsylvanian find in northwestern Kansas could possibly be even more important than the others. R. G. Lawton recovered oil on test of the Topeka at 4,524-66 ft. at his 1 Rueb in Cheyenne County. This wildcat, 9 miles west of St. Francis, apparently opens first production in the county, and even more important, taps the first Topeka production in the entire region. Topeka is farther up the hole than the Lansing-Kansas City, Marmaton, and Cherokee zones in Llanos field. It produces many miles to the south in Greenwood field. The Cheyenne prospect is close to the Colorado line and nearer to the main part of the Las Animas arch than are the other discoveries. It is 20 miles southwest of a small Pennsylvanian pool opened at Judy in 1951 which has long since been abandoned. Lawton's wildcat is in the remotest of oil-hunting territory.

A flat prediction . . . Many very important wildcat events will take place in the Powder River basin and along the Las Animas arch in the coming year. Wildcat plans have already been announced for Kit Carson County in Colorado. We can look for a big splurge of pre-Cretaceous drilling in Powder River. As is the case with **all** new provinces, more wildcats are needed.

Great Basin:

Giant sleeper of the west

The vast, sweeping deserts and isolated mountain ranges of western Utah and eastern Nevada have, with but two exceptions, offered nothing but discouragement to the driller in search of commercial oil or gas production. Yet, geologically, the region has a great deal of merit as a potentially productive oil and gas province. This article will point out some facts that should cause even the most conservative oil man to ponder the possibilities of the region.



A HUGE EOCENE BASIN covers much of eastern Nevada and extends into western Utah. Notice the area of deposition of the Green River formation in the Uinta basin of Utah.

BY EDGAR B. HEYLMUN
Consulting Geologist, Salt Lake City

THE FIRST DRILLING on record occurred in 1892, when several shallow wells were drilled 3 miles southwest of the town of Farmington, Utah, near the foot of the towering Wasatch Range. Inflammable gas was discovered in as many as nine different sands between 400 and 700 ft. in Quaternary lake sediments. Between 1892 and 1896 around 20 shallow wells were drilled in an area of 1 sq. mile, and in 1895 a pipeline was laid to Salt Lake City, 12 miles to the south. The field supplied Salt Lake City with 833 B.t.u. gas for 19 months before dwindling reserves forced abandonment. The practice of making barefoot completions in loosely consolidated sediments caused the wells to sand up prematurely, and production was lost. It is estimated that the Farmington gas field produced about 150 M.M.c.f. of gas, with a maximum monthly production of 17 M.M.c.f.

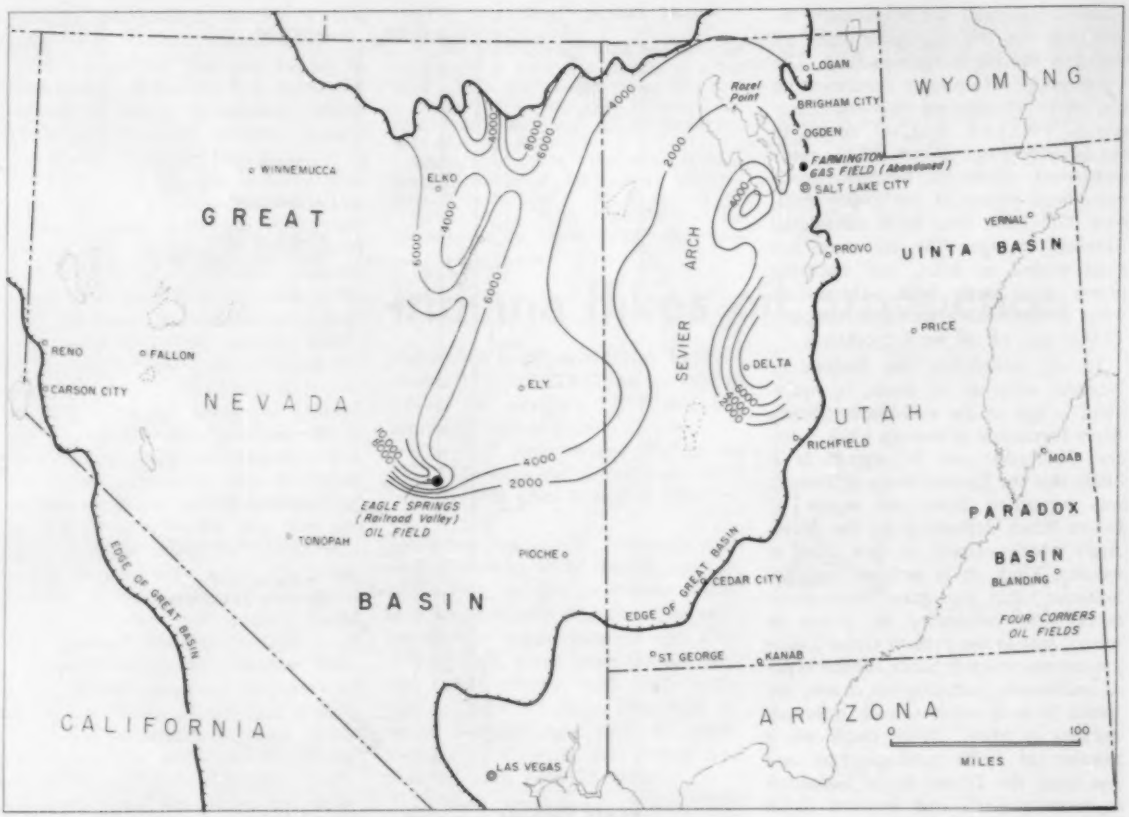
In 1904 drilling began at Rozel Point, on the north shore of Great Salt Lake. The largest and best-known asphalt seeps in the Great Basin are located under the waters of Great Salt Lake at that locality. A series of wells, mostly shallow, were drilled in the area in a vain attempt to find an oil reservoir at depth. Asphaltic sands were encountered between 80 and 140 ft. in some of the wells, and it is probable that the source beds for the asphalt are the Quaternary lake sediments in which it occurs.

During the twenties scattered drilling took place at several localities in Utah and Nevada. Two wells were drilled for water 10 miles west of Brigham City, Utah, and both encountered a number of gas sands. A particularly good gas sand was topped at 340 ft. in one well. An analysis of the gas showed it to contain 87.9% methane with no lower fractions present. The deepest of the two wells went to 1,028 ft., bottoming in Tertiary sediments, but all gas shows were above the Quaternary-Tertiary contact at 514 ft. In Nevada, drilling was being done along Illipah Creek in the White Pine Mountains, west of Ely. Several wells encountered oil and gas shows between 95 and 1,600 ft., presumably in beds of Mississippian age. Farther west, a series of wells were drilled into Quaternary lake beds near the town of Fallon, and small amounts of inflammable gas were recovered. Some of this gas was used locally in the area.

A well was drilled to 1,985 ft., bottoming in Miocene lake beds, in 1931, just north of the Salt Lake municipal airport. A black, pitchy hydrocarbon was found in a sand at 695 ft. and a significant gas sand was encountered at 750 ft. Both showings were in sediments of Quaternary age, as is the case of the asphalt occurrences at Rozel Point, 55 miles to the northwest. The gas from the well was used in local farm houses for a long time. An analysis showed it to contain 84.6% methane, a small amount of ethane, and virtually no undesirable compounds such as carbon dioxide and hydrogen sulfide. The B.t.u. value of the gas was 874.

In addition to this well, a number of water wells in the same area emit inflammable gas, mostly from shallow depths.

Very little drilling was done in the Great Basin between 1931 and 1948. After 1948, major oil companies and independents entered into the region and a number of important deep tests were drilled. Wells drilled by independents near Las Vegas and Elko reportedly had shows of oil at relatively shallow depths, while several shallow wells near the Bruffy oil seep, 50 miles southwest of Elko, had oil shows in Ordovician rocks. Over a



THIS SPARSELY DRILLED BASIN offers the geologist all the requisites for a potential oil province. The isopachs indicate the approximate aggregate thicknesses of Tertiary and Quaternary beds.

period of several years, Gulf Oil Co. drilled a number of deep tests in the region, and one, located 45 miles northeast of Elko, had a show of oil in beds of probable Eocene age.

Discovery provides impetus . . . The biggest drilling boom occurred between 1954 and 1957. Nevada's first commercial oil well was completed in 1954 by Shell Oil Co. in Railroad Valley, 55 miles southwest of Ely. The well had an initial production figure of 373 bbl. of 27.8° API oil per day from a welded rhyolitic tuff of Oligocene age between 6,430 and 6,730 ft. The source of the high-pour-point (80°-85°) oil was probably in the underlying Eocene limestones and marls, which also had good oil shows in the well. The second well drilled at the field produces from the Eocene interval. In all, only three producing wells have been completed, and they are known, collectively, as the Eagle Springs oil field. Several other tests in Railroad Valley failed.

After the excitement of the discovery of commercial oil in Nevada subsided, scattered drilling continued throughout the region. Two relatively deep tests were drilled in Cache Valley, near Logan, Utah. One well went to 5,208 ft., the other to 5,500 ft., and both encountered significant gas shows in various Miocene sands between 2,650 and 5,200 ft. Two wells were drilled west of Brigham City that found subcommercial quantities of gas in Quaternary lake beds. In Tooele Valley, 25 miles west of Salt Lake City, a well was drilled to a depth of 5,486 ft., and reportedly had a gas show in Pennsylvanian rocks near the total depth. The last test drilled in the Great Basin that was known to have encountered significant shows of oil was 38 miles south of Ely, Nev., where a 4,811-ft. well penetrated an Eocene limestone and sandstone section containing considerable oil staining.

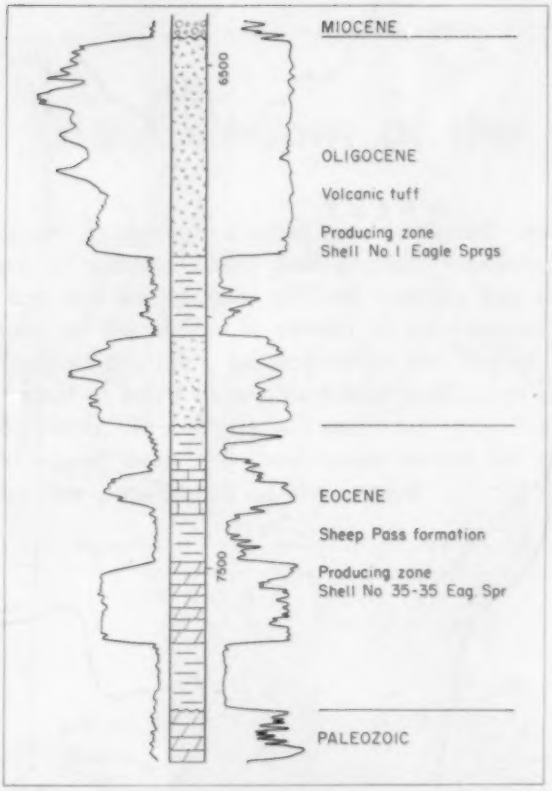
Encouraging results . . . A minimum of 38 wells have had fair to good shows of oil or gas in the region. There is one abandoned gas field and one producing oil field. Most of the important oil and gas shows have been in Tertiary and Quaternary formations, and the impression is that these units hold the most promise for additional production in the future. The intense structural deformation that has affected the older rocks somewhat dims their attractiveness, although the chances for finding oil or gas in such formations as the Ordovician Eureka sandstone or the Mississippian Illipah sandstone cannot be overlooked. Some of the Devonian, Pennsylvanian, and Permian sequences also have merit.

Petroliferous limestones and dolomites are known in several intervals through the thousands of feet of Paleozoic rocks that are present in western Utah and Nevada, and oil staining is commonly found in wells drilled through the units. Generally speaking, however, Tertiary and Quaternary sediments have the most merit, a fact that has been recognized by most major operators who have drilled tests in the region within the last 4 years.

Eocene rocks . . . In a rather little-known Eocene basin in eastern Nevada, the Sheep Pass and White Sage formations are the only Eocene units that have been named in the area, and they may be coeval. The sediments consist of marlstones, limestones, dolomites, and dark shales, along with lesser amounts of sandstones and conglomerates. The volcanic debris that characterizes younger Tertiary beds is sparse or missing in sediments of Eocene age. Many of the limestones and dolomites are distinctly

petroliferous, and are apparently responsible for the high-pour-point oil found at the Eagle Springs field. The hodge-podge Humboldt formation in northern Nevada has Eocene limestones, shales, and oil shales in the basal 500 to 1,000 ft. of the thick formation. Definite Eocene fossils have been found in the lower units, beds that have long been considered Miocene in age. The oil shale has been mined at Elko, and retorting plants have been built. Operations were abandoned after approximately 15,000 gal. of oil were produced.

In all probability, the Eocene of Nevada, with its oil shale, is equivalent in age to the well-known Green River formation of eastern Utah, western Colorado, and Wyoming. It is likely that the Eocene basin in Nevada was separated from the region of Green River deposition by the Sevier Arch which existed at that time in western Utah. It is entirely possible, however, that the great fresh-water lakes were connected by rivers or straits, just as the present Great Lakes are interconnected. Since similar types of sediments, including oil shales, are found in both regions, such interconnection is likely. Since there are a number of fields producing oil and gas from the Green River formation in eastern Utah and western Colorado, the potential of the Eocene lake deposits in eastern Nevada warrants serious consideration. Aside from the oil production at the Eagle Springs field, several other wells in various parts of eastern Nevada recorded good oil shows in Eocene beds.



EAGLE SPRINGS is Nevada's only oil field, and here is the producing zone. The discovery produced from a rhyolitic tuff.

Volcanic activity . . . Overlying the Eocene lake sediments where present, or overlying older rocks elsewhere, is a fairly widespread blanket of volcanic tuffs, agglomerates, and flows of definite Oligocene age. The Oligocene was a time of great volcanic activity throughout Utah and Nevada, and its deposits hold little interest for oil and gas production. It is interesting to note, however, that oil is produced from Oligocene volcanics at the Eagle Springs field, although it is probable that the volcanics are merely acting as a reservoir for oil that was generated in the underlying Eocene beds. Nevertheless, the possibilities of the volcanics as reservoir beds should not be down-graded.

Following the widespread volcanic eruptions, sporadic eruptions continued through the rest of the Tertiary period. This resulted in the deposition of considerable volcanic material, such as tuff and ash, in the later sediments. In the Miocene and Pliocene, however, a great system of fresh-water lakes spread over much of western Utah and Nevada. Since the configuration of the land was similar at that time to the present topography, the lakes occupied the areas that are now valleys. Thousands of feet of sands, silts, tuffs, limestones, marls, and shales now lie buried under many of the broad desert valleys. The sequences are grouped with the Humboldt formation in northern Nevada and with the Salt Lake formation in northern Utah, but both names have been used indiscriminately for various occurrences of little-known Tertiary sediments and volcanics. A deep well near Delta, Utah, penetrated over 8,000 ft. of unnamed Quaternary and Tertiary beds, the thickest occurrence known in Utah. Several wells in Nevada have penetrated over 8,000 ft. of Quaternary and Tertiary units.

There have been no significant shows of oil reported in sediments of Miocene or Pliocene age in the Great Basin, but several wells in northern Utah encountered important gas sands in the Salt Lake formation. These tests were briefly discussed earlier. Outcrops of the Salt Lake formation exhibit porous sands, petroliferous limestones, organic shales, and lignite beds at numerous localities, so the necessary elements for oil or gas production are present. While the Miocene and Pliocene beds have been folded and faulted, they have not been as structurally deformed as have the older formations. Geophysical surveys would be necessary, however, to locate most structural features in the valley regions of the Great Basin, as the alluvium masks all underlying characteristics.

Overlying the Miocene and Pliocene sequences in all of the valleys are varying thicknesses of loosely consolidated Quaternary sediments. Clays, gravels, sands, and peat beds constitute the bulk of the sediments found. Bedded gypsum is found in the Quaternary of western Utah, and a variety of evaporites are known in the Quaternary of Nevada. The thickest occurrences of Quaternary sediments are adjacent to the highest mountain ranges, and immediately west of the Wasatch Range are well over 1,000 ft. thick. Many of the gas shows obtained in wells around Salt Lake City were from sands in the thick Quaternary section. Most of these wells, along with the asphalt seeps at Rozel Point, have been previously described. Conditions similar to those in Utah may be found in the Quaternary of

Nevada, particularly in the Fallon area.

The origin of the gas found in Quaternary sediments has been the subject of much speculation. While there are extensive marshes around the shores of Great Salt Lake, it is not likely that the gas is being generated in the existing marshes. The depth of some of the gas shows and the presence of gasoline fractions in some of the gas precludes such an origin. The gas, however, was probably generated in marshes and peat bogs associated with ancient freshwater lakes that were covered by later sediments. This, of course, would be similar to the origin of natural gas at virtually any gas field. Since the existing evidence indicates that the Quaternary sands are lenticular and discontinuous in nature, it is likely that if commercial gas was developed from them the production would be relatively small. The shallowness of the sands and the possibilities for close well spacing would tend to offset this disadvantage.

There would be few location difficulties in the vast desert expanses of the Great Basin. Water for drilling would be a problem in some areas, although water wells can frequently be drilled with little difficulty. Drilling in the hard limestones and dolomites of the Poleozoic is expensive and time consuming, but the younger formations submit quite readily to the drill bit. Aside from infrequent volcanic flows or conglomerate beds, most of the Tertiary can be drilled at a rate of 1 ft. per minute. Some of the conglomerate zones or zones of loosely consolidated cobbles have caused difficulties in drilling, though there are few instances of operations being suspended because of such troubles.

One of our more obscure oil and gas provinces exists in the enormous Great Basin of western Utah and Nevada. The presence of petroliferous sediments throughout the stratigraphic column is of interest to the oil and gas seeker. The comparatively untested Tertiary and Quaternary units, with their beds of oil shale, petroliferous limestone, and lignite, offer unlimited possibilities for future oil or gas production.

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Indiana hikes oil production

INDIANA'S oil production in 1957 totaled 11,810,000 bbl., an increase of 33,000 bbl. over the 11,777,000 bbl. produced during 1956.

The 727 wells drilled during the year represents an increase of 4.0% over the 699 wells drilled in 1956.

Southwest leads . . . Although wells were drilled in 45 of the 92 counties, about 85% of the total were drilled in 8 southwestern counties. The eight counties in which most of the 1957 drilling took place were Gibson with 200 wells, Posey with 140 wells, Spencer with 87 wells, Pike with 61 wells, Vanderburgh with 47 wells, Knox with 37 wells, and Bubois and Sullivan each with 22 wells.

. . . Well breakdown. The 1957 drilling resulted in 236 oil wells, 17 gas wells, and 474 dry holes. Of the 727-well total, 219 were classed as wildcats and 508 were classed as field wells. Of the 219 wildcats, 6 resulted in new-pool discoveries, 9 resulted in extensions to existing pools, and 4 resulted in additional pay-zone discoveries in productive areas. Of the 508 field wells, 217 were oil, 17 gas, and 274 dry.

. . . Pay divisions. All the successful exploratory wells were completed in rocks of either the Pennsylvanian or Mississippian systems; 5 were completed in Pennsylvanian, 14 in Mississippian.

Of the six new-pool discoveries, one was completed in Pennsylvanian sand and five in Mississippian rocks (all in the Chester—one in Cypress sand and four in Aux Vases dolomite and lime). Of the nine extensions, three were completed in Pennsylvanian sand and six in the Mississippian (five in Chester sand and one in the Ste. Genevieve lime). Of the four new pays, one was completed in Pennsylvanian sand and three in the Mississippian (two in the Chester—one in Tar Springs sand and one in Aux Vases dolomite—and one in the Ste. Genevieve lime).

Exploration . . . The most significant wildcat wells were extensions to existing pools. One of the important wildcat extensions was the Stouder Drilling Co. 1 Herschelman in 7-6s-11w, western Vanderburgh County, which was completed in Waltersburg and Tar Springs sands as an extension to Belknap pool. The extension well was completed in April, and development in the extension area during the remainder of the year resulted in seven wells that had a combined daily production of 59 bbl. and a cumulative production of 32,851 bbl. Only the extension well was completed in both the Waltersburg and Tar Springs; the other six wells were Waltersburg producers.

Another significant extension well was H. C. Farmer 1 Doyle, 29-6s-5w, southern Spencer County, which was completed in Cypress sand as an extension to Grandview pool. It was completed in October, and by the end of the year three wells having an average initial production of 60 bbl. per day had been completed in the

AFTER several years of lagging drilling activity, Indiana is back on the road to exploration and development. For the past 2 years well completions show a healthy gain.

extension area. The extension well to Grandview pool and the discovery well of West Grandview pool are close to each other. The discovery well of West Grandview pool, 31-6s-5w, was completed shortly after the Grandview extension. By the end of the year, permits had been issued to drill 17 additional wells in the vicinity.

A third significant extension was C. E. O'Neal & Co. 1 Thompson, 33-2s-11w, West Central Gibson County, which was completed as an extension to Owensville East Consolidated pool. It was completed in Bethel sand in July, and by the end of the year, six wells having a combined daily production of 115 bbl. and a cumulative production of 12,028 bbl. had been completed in the area. Development in the extension area during the year indicates the existence of a continuous Bethel sand reservoir in the area between the Owensville East Consolidated pool and King pool.

Two new discoveries are North Oliver in northern Posey County, and Scott pool in western Gibson County. In North Oliver, discovery at Rush Creek Oil Co. 1 Wittekindy, 26-5s-13w, six Pennsylvanian sand wells, at a depth of 1,280 ft. had been completed by the end of the year. These wells had an average output of 28 bbl. per day. In Scott pool, opened by T&H Corp. at 1 Scott, 32-2s-12w, two Cypress sand wells, at a depth of 2,220 ft., had been completed by year's end.

Remote wildcats . . . During 1957 three important wildcats were drilled in the area far outside the Illinois basin.

In the area of northeastern Indiana that lies on the south edge of the Michigan basin, three deep wells were drilled by Ambassador Oil Corp. Two of these wells, one in Steuben County and one in Lagrange County, penetrated the Eau Clair formation of late Cambrian; and the other well in Steuben County went into the Knox dolomite of early Ordovician. In addition, wells were drilled into the Ordovician portion of the Knox dolomite in Clinton, Jennings, Monroe, and Wayne counties.

Secondary recovery . . . Oil obtained by secondary-recovery methods continued to be a significant factor in maintaining Indiana's oil production.

Secondary production is estimated to be slightly less in 1957 than in 1956, the peak year. It amounts to 35% of the state's total production. Although secondary production apparently has begun to decline in Indiana, it will continue to be important to the state's oil output in coming years.

This account of 1957 drilling and production in Indiana is an Indiana Department of Conservation, Geological Survey, publication, authored by T. A. Dawson and G. L. Carpenter. Copies of the entire report can be obtained from the above office at Indiana University, Bloomington.

EDITOR'S NOTE . . . As of November 22 total well completions in Indiana (Oil and Gas Journal figures) for 1958 stand at 768 compared to 620 at this date in 1957. Wildcatting in the state is substantially up—278 compared to 116 at the same date in 1957. Drilling and development in Indiana are on the upgrade compared to neighboring Illinois, the biggest producer in the Tri-state region.

NW Oklahoma holds its lead

NORTHWESTERN OKLAHOMA exploratory and development activity continues its lead over regional news.

. . . Panhandle. Carter Oil Co. 1 Gilbert Unit in C SE NW 6-2n-19eCM, North Hardesty area of Texas County, flowed open 56,794 M.c.f.d. of gas from Morrow-Pennsylvanian at 6,360-72 and 6,420-32 ft.

. . . North Buffalo. A new well is slated for North Buffalo field in Harper County. The new try is An-Son Petroleum Co. 1 Miller in C NW NW 8-28n-22w, east of the field discovery well (an Arbuckle producer), and southeast of the Sinclair well that is to be completed in three zones of the Pennsylvanian. An-Son's well will go to the Arbuckle at 7,900 ft.

Sinclair Oil & Gas Co. has a well going at 1 Miller in C NW NE 7-28n-22w, a 40-acre east offset to the discovery of the field. Meanwhile, the company is completing the 1 Kuhn in C NW SE 6-28n-22w, in the Lansing, Kansas City, and Oswego limes. This well is without a doubt the most important single discovery in Oklahoma this year.

. . . North Lovedale. An extension and new-pay discovery is reported at this Harper County field. Hamilton Brothers, Ltd., 1-2 Sanders in C SW NE 2-27n-21w, flowed 27 bbl. of 42°-gravity oil daily on ½-in. choke from the Kansas City lime at 5,163-67 ft. The field pay is the Oswego, another Pennsylvanian zone. Perforations in the Kansas City are at 5,163-67 ft.

. . . Woodward County. The second well in Woodward field, just south of the city of Woodward, was completed by Sinclair at 1 Walsh Unit in C SW NW 2-22n-21w. The well is west of field discovery. Flow was 8,500 M.c.f.d. after treatment from Morrow-Pennsylvanian perforations at 8,310-32 ft. on test. On final test, it flowed 31 bbl. load oil, 135 bbl. of 51°-gravity distillate, and 30 bbl. salty water in 24 hours on 1-in. opening plus 7,440 M.c.f. of gas.

. . . Texas County. The second well in a new pool in the Guymon area was completed by Phillips Petroleum Co. at 2 Wavia in SE SW NE 17-1n-15eCM. The well flowed 42,287 M.c.f.d. of gas and 120 bbl. distillate per day from the Cherokee-Pennsylvanian (a new pay) at 5,922-35 and 5,961-80 ft.; from the Oswego (regular field pay) at 5,765-92 ft. it made 62,213 M.c.f.d. and 35 bbl. distillate. This unnamed field was opened at Phillips 2 Pearl in C NW NW 16-1n-15eCM. The field lies inside the limits of vast Hugoton Permian gas field, but it is about 15 miles from any Oklahoma pre-Permian production; the same distance from pre-Permian gas in Texas Panhandle.

Montana adds two dual producers

NORTHWESTERN MONTANA'S teeming new Red Creek field in Glacier County added two dual oil completions. Salt Dome Production Co. completed the 1 E. Moberly in C SE SE 2-37n-5w for 190 bbl. of oil per day from Cut Bank and 125 bbl. of oil per day from Madison. The other well is the 1 W. Moberly in C SW SE 2-37n-5w. It pumped 125 bbl. per day from Cut Bank and 123 bbl. from Madison.

This new field is directly west of the Darling area and just south of the Canadian border. Carter Oil Co. has a discovery north of the above mentioned wells at 1 Moberly. Recovery on tests was 2,700 ft. of free oil in the Cut Bank. This well is in C NE SE 2-37n-5w. Carter also has discovered oil in the Madison at this well at 2,788-2,838 ft. and 2,838-45 ft.

Big well boosts new Ohio area

COMPLETION of 1 L. F. Carney as one of the largest wells in the new producing area southeast of New Lexington is reported by Stewart Oil Co.

The test, in Section 21, Pike Township, Perry County, logged Clinton sand at 3,305-26 ft. with 10 bbl. natural and flowed 255 bbl. in 4 hours after fracture with 1 M.M.c.f. gas.

Buena Vista Hills field sparks drilling on California land . . .

WITH SIX RIGS ACTIVE, the Buena Vista Hills field tops the state in drilling interest.

The goal is the Stevens sand "555" pool originally discovered a little more than 1 year ago. Since that time, seven wells have been completed in the Miocene pool which has been extended to the north, south and west mainly.

The current activity was all west of the discovery well. A rundown showed:

. . . **Richfield Oil Corp.** with three rigs going topped the list. These included a well a little more than ¼ mile northwest of the discovery and two others in the extension category. Of the latter two, one was an offset to a new pay found early last month by Honolulu Oil Co. 1 mile west of Tidewater Oil Co.'s pool discovery well. The other was drilling below 4,472 ft. on a site almost ¼-mile northwest of the discovery.

. . . **Honolulu** was continuing work on 10 Calidon, its new pool discovery, and was drilling another test less than ¼ mile due south of it.

. . . **Standard Oil Co. of California** was also active in the play with a company rig coring below 5,549 ft. on an extension about ¼ mile southwest of the nearest producer in the main area of the pool.

. . . **Tidewater Oil,** discoverer of the pool, just completed its fifth well in the new pay for 734 bbl. daily of 30.5°-gravity crude. This latest completion, 536 Well, is just several hundred feet south of Tidewater's 525 Well which was brought in recently flowing at a rate of 2,900 bbl. daily on a 74/64-in. choke.

In addition to the seven wells now completed in the pool, and the six rigs currently drilling, operators have announced locations for five additional wells in the coming months. The wells average around 5,500 ft.

. . . while coring program gives offshore encouragement

ITS FIRST CORE HOLE on the 3,840-acre offshore parcel it holds jointly with Humble Oil & Refining Co. off Gaviota had encouraging gas and condensate shows, reports Standard Oil Co. of California.

The zones tested weren't revealed, but the core hole, drilled from California's only mobile drilling platform, was total-depthed at 7,748 ft.

It was being abandoned in a manner which will permit the operator to go back into it at a later date. The coring program is being conducted on this parcel to find a favorable spot for a permanent drilling platform.

Phillips Petroleum Co., as operator for itself and a number of other companies and individuals, was conducting a similar coring campaign on another 3,840-acre parcel in the same general Santa Barbara County area using a floating drilling barge.

Drillers hit in three Kansas counties

KANSAS exploration centers in McPherson, Graham, and Ellis counties. A new gas pool was opened in McPherson, Lansing-Kansas City production was opened at a Graham wildcat, and potential is awaited at an Ellis County wildcat.

Mississippian gas production was opened at Donald T. Ingling 1 Stucky in NW SE NW 22-20s-3w, 1 mile north of oil production at Voshell pool. The gasser made 1,500 M.c.f.d. from open hole at 3,075-97 ft. Operator shut in the well waiting for market.

K. & E. Drilling Co. 1 Johnson, NW NW NW 5-9s-25w, west of Knoll field in Graham County, made 125 bbl. of oil per day from the Lansing-Kansas City Pennsylvanian lime at 3,981-86 ft.

Pump is going up at a new Ellis County Arbuckle oil discovery. Birmingham-Bartlett Oil Co. 1 Herbert, C S½ SE SW 18-13s-20w, ¾ mile southwest of Raynesford pool, made 5 bbl. of oil per hour from open hole at 3,907-11 ft.

Harper has pay

SOUTHERN KANSAS' Harper County has a new oil-pay discovery in a recently opened gas field.

Walters Drilling Co. 1 Unruh in NW SW SW 12-32s-7w, got 125 ft. of clean oil on a drill-stem test in the Simpson at 4,735-40 ft. The well is in a gas area. Previously, the 1 Unruh had found the field gas pay at 4,704-28 ft., getting 7,120 M.c.f.d.

Sedgwick basin . . . Kingman County's Spivey-Grabs field was extended 1 mile at a Rupp-Ferguson Oil Co. well, the 1 Griem in NW SE SE 2-30s-9w.

The new well flowed oil at the hourly rate of 20 bbl. plus 3 M.M.c.f.d. of gas. Perforations were in the Mississippian at 4,208-18 and 4,191-4,200 ft.

Interest high in central Kansas

CENTRAL KANSAS developments last week included discoveries in Graham, McPherson, Norton, and Trego counties.

Northwest Nana pool was opened in Graham County by Burch Drilling Co. 1 Goff in SW SW SW 33-7s-23w. Pump potential was 163 bbl. of 41.4°-gravity oil daily. Pay is Lansing-Kansas City at 3,956-85 ft.

A Viola producer opened Northeast Groveland pool in McPherson County. Time Petroleum Co. 1 Southwestern College in SE SE SW 2-20s-4w, made 50 bbl. of oil daily on pump. Viola perforations are at 3,714-20 ft.

Norton County's new pool is Spiess in NW NW SW 35-5s-25w. K&E Drilling Co. 1 Spiess made 75 bbl. of oil per day from Lansing-Kansas City at 3,645-46 ft., 35° gravity.

Birmingham & Bartlett Drilling Co. 1 Egger in SW NE SW 12-13s-21w, discovery of Egger pool, made 149 bbl. of oil per day on pump from Arbuckle. Gravity is 41°.

Michigan tests pay

SALINA E-zone oil production at 1 Confer, SW NE NE, Section 1-3n-14w, Health Township, Allegan County, in the old Diamond Springs 1,600-ft. Traverse oil pool is being tested by Muskegon Development Co.

Pay was logged at 2,389-2,400 ft. with well recovering an average 35 bbl. after 1,000-gal. treatment. Salina section is paying off with both gas and oil in several other old Traverse oil areas of Allegan County.

Fishing job continued to plague Mask and McClure's 1 Rosenau, NW NW SW, 23-3s-4w, Calhoun County wildcat, and a decision was reached to set whipstock at 4,040 ft. in an attempt to sidetrack hole around the fish. The wildcat had logged Trenton at 3,888 ft. and was showing 2,800 M.c.f. gas and spray of oil at 4,085 ft. when cable-tool bit was lost.

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Powder River basin

rewards the strat-trap detective

THE Powder River basin, long a structural domain, is rapidly emerging as an area where strat traps are playing a dominant role. Within the last 10 years, 50 new oil fields have been tapped, and the majority of these owe their origin to stratigraphy rather than structure. Thirteen of these 50 pools fall in the 15 to 20-million-barrel reserve bracket, and undoubtedly many more exist. The only problem is to find them.

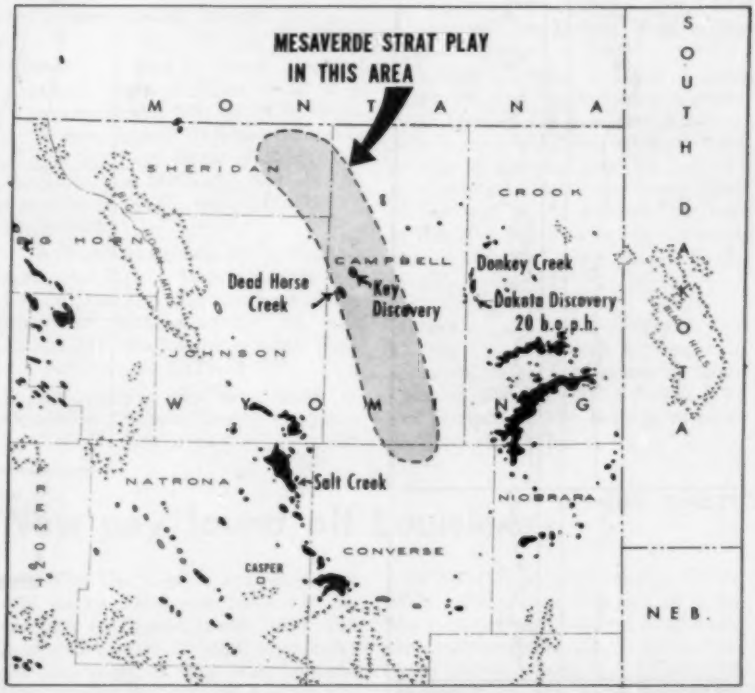
Two recent discoveries have helped fan the exploration blaze in the Powder River basin. A Mesaverde oiler was completed 6 miles northwest of Dead Horse Creek with production from the Parkman sandstone early in 1958. The well flowed 20 b.o.p.h. and opened the Barber Creek field.

A Dakota wildcat 2½ miles southeast of South Donkey Creek flowed oil at the rate of 20 bbl. per hour.

The Powder River basin is not a new oil province since it has produced 48% of Wyoming's total production, and most of this oil has come from structures originally mapped by surface geology. Now, however, with the wave of recent discoveries, Wyoming geologists are taking a closer look at the Powder River basin pay zones, particularly the Cretaceous sands.

The Denver basin, lying just to the south, has proved to be an area where strat traps in the Cretaceous D and J sands have been profitable. Will the Powder River basin outshine its neighbor to the south? There is no reason why it can't. The Powder River basin covers a larger area and is the second largest structural basin in the Rocky Mountains. The basin embraces nearly all of eastern Wyoming between the Big Horn Mountains on the west and the Black Hills uplift on the east. Its importance is highlighted by the fact that the Wyoming Geological Association recently conducted its thirteenth annual field conference in the Powder River basin and has published an excellent guidebook on it.

First production in the basin dates back to 1887 when shallow wells found low-gravity oil in a lens, the Newcastle sandstone, along the west flank of the Black Hills. Oil at Salt Creek in 1908 triggered the first Rocky Mountain boom and brought an influx of surface geologists to the area between 1910 and 1930. However, it has only been within the last 10 years that the real potential of the basin has been recognized.



SAND PINCHOUTS in the Cretaceous have ignited an intense exploration program in the Powder River basin of Wyoming, second-largest basin in the Rocky Mountains.

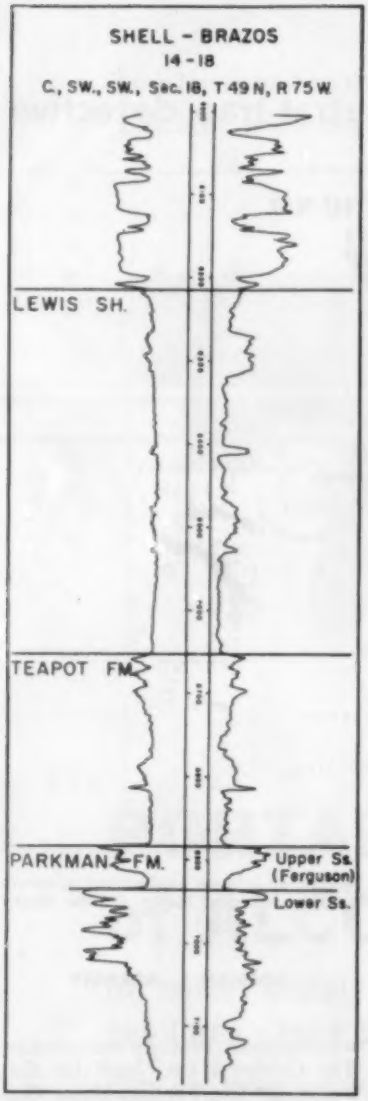
NORMAN S. MORRISEY

Dead Horse Creek field, discovered in 1957, has given strong impetus to the present exploration activity. Dead Horse Creek is a strat trap, although structure plays a minor role in controlling oil accumulation. The pay zone occurs at a drilling depth of 6,900 ft., and it is designated the Ferguson sand. Dead Horse Creek is the first commercial oil accumulation in the Mesaverde formation of the Powder River basin.

The field already covers 2,300 acres and is still being actively developed. At present, a completed producer costs in excess of $100,000 and a dry hole can be drilled for approximately $50,000. The field is being developed on 80-acre spacing because of the relatively thin pay zone and the low estimated ultimate recoveries. Present data indicate that primary production will recover only 1,000 to 2,000 bbl. per acre. The Ferguson at Dead Horse Creek is a sand lens that reaches a maximum thickness of about 35 ft. and trends roughly northwest-southeast. Principal operators are The California Co., Shell Oil Co., Brazos Oil Co., Farmers Union Central Exchange, Hiawatha Oil & Gas Co., and Pure Oil Co.

Cretaceous pinchouts . . . Sands in the Mesaverde formation are an attractive target for the bit. Geologists know that the outcropping sands along the west flank of the basin pinch out in a belt approximately 30 miles wide that extends across Sheridan, Johnson, and Campbell counties. Here the Teapot, Dead Horse, and Parkman sands undoubtedly pinch out updip and should prove productive locally. There seems little doubt that additional production may also occur in the Ferguson or Dead Horse sand, as it is termed locally.

But the Mesaverde sands are only one target. There are many other Cretaceous sands that can and do produce where stratigraphic conditions are favorable. Both Upper Cre-



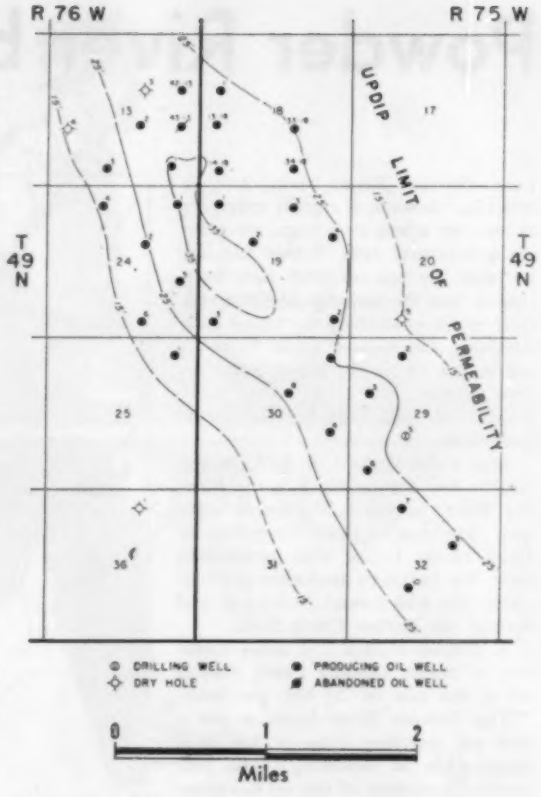
DEAD HORSE Creek field produces from the Ferguson, a sand at the top of the Parkman-Cretaceous formation. This is a typical log for the field.

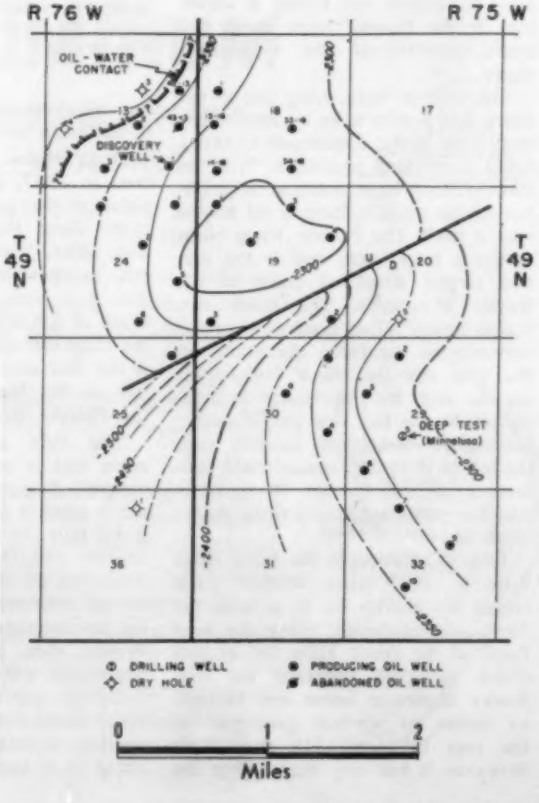
taceous and Lower Cretaceous sands fall in this category.

Structural traps . . . Probably the most significant structural trap discovered in the basin since 1950 has been the Donkey Creek field, uncovered in 1953. The discovery was completed for 30 bbl. per day, but the field has undergone a rapid development program only since 1956.

Donkey Creek is a multipay field with production from zones in the Dakota and the Minnelusa, a Pennsylvanian sand that is correlative with the Tensleep. One well at Donkey Creek produces from the Muddy. The Minnelusa or Tensleep production is highly significant since it is 70 miles

AN ISOPACH MAP of the producing sand (Ferguson) at Dead Horse Creek field, Campbell County, Wyoming.





STRUCTURE on top of the Ferguson reservoir at Dead Horse Creek reveals accumulation on both sides of a southwest-northeast fault. Contour interval 25 ft.

northeast of the nearest important production from the same zone.

Most of the oil production in the Powder River basin has been from Cretaceous zones, but fields like Donkey Creek provide added incentive for deeper drilling. Thus far in the Powder River basin, the Minnelusa or Tensleep has proved to be the deepest producing horizon. The Madison limestone, a prolific producer in many Wyoming basins, is present throughout most of the Powder River basin.

Deep tests that have tapped the Madison, however, have proved disappointing and have tended to dampen any active Madison exploration campaign. Salt Creek is the only structure that has yielded a significant show of oil from rocks of Madison age, but the zone is not commercial.

Note: The Wyoming Geological Association Guidebook on the Powder River basin is available from the society (Box 545, Casper, Wyo.). It contains a detailed description of the stratigraphy of the producing formations in the basin as well as papers on the oil and gas fields. Figures 2 and 3 as well as most of the factual data contained in this article appear in the Guidebook.

Cockfield pool opens in SE Texas

A NEW FIELD is being opened by Sunray Mid-Continent Oil Co. in southern Newton County, in southeastern Texas.

The discovery well, 1 Hankamer, already has proved productive in two zones, one in middle Cockfield sand at 8,696-8,702 ft., and the other in lower Cockfield sand at 8,970-80 ft.

Other sands giving indications of commercial production remain to be tested. Hole was drilled to 9,004 ft.

On drill-stem tests, the lower Cockfield sand flowed at the rate of 180 bbl. of 45.2°-gravity oil per day through ⅛-in. choke, and the middle Cockfield sand at the rate of 87 bbl. of 36.5°-gravity oil per day through 5/32-in. choke. Flowing pressure in the former was 1,025 psi. with gas-oil ratio of 1,168 cu. ft. per barrel. In the upper zone it was 580 psi. with gas-oil ratio of 1,609 cu. ft. per barrel.

Location of the well is 8 miles northwest of Deweyville, and about 2 miles south of Sabine Tram field, nearest production. It is on a lease spread of 4,500 acres held by Sunray in the vicinity, designated as Cypress Creek area.

Tristate activity continues to climb

ILLINOIS BASIN developments last week included discoveries in Wayne, Hamilton, Gallatin, and Jefferson counties, Illinois plus a new discovery in Spencer County, Indiana.

Illinois . . . Alva C. Davis is testing the Aux Vases at 3,284-94 ft. at 1 Winzenburger in NE NE NW 18-3s-9e, Wayne County This new wildcat is 1 mile north of Burnt Prairie. The Rosiclare and McClosky will also be tested at 3,384-91 and 3,424-31 ft., respectively.

In Hamilton County, H. N. Sanders completed 2 J. J. Wilson in NW NE SW 26-5s-6e, 2 miles southeast of the town of McLeansboro. The well flowed 150 bbl. of oil per day from the Rosiclare at 3,173-78 ft.

The booming new area south of Omaha in Gallatin County continues to flourish. Last week's addition was T. W. George 1 William R. Utley in NE SE SW 34-7s-8e. This one flowed 1,000 bbl. of oil per day from Aux Vases at 2,712-28 ft. The well was an old dry hole drilled deeper. This is currently the hottest play in the basin.

A new discovery is slated 2 miles south of Kell in Jefferson County. E&G Drilling Co. 1 Harvey Keneipp, 5-1s-3e, swabbed 2 bbl. of oil per hour on test of the McClosky at 2,611-15 ft. Completion work has begun south of this well at the 1 Riley-Tate unit in NE NW NE 8-1s-3e. A drill-stem test in the McClosky got 1,020 ft. of oil.

Indiana . . . Clay Herrell and Cox Drilling Co. completed a pumper in Spencer County, 2 miles east of Santa Claus in SW NE NE 8-5s-4w. The well pumped 30 bbl. daily from Jackson sand at 678-702 ft.

New pay found off Louisiana

COMPLETION of a zone-discovery well on its 5,000-acre block off the east side of Eugene Island Block 188 field in the Gulf of Mexico 35 miles off the coast of St. Mary Parish, Louisiana, is reported by Sinclair Oil & Gas Co.

The new pay, productive of gas and condensate, is about 1,800 ft. shallower than the oil-productive zone opened by Sinclair in its discovery well on the block. The latter well, completed last July, is a location north of the new gas-condensate well, the second successful well on the block.

Producing zone of the new-pay well, 1 OCS-O439, is perforated at 7,460-68 ft. It flowed at the rate of 4,560 M.c.f. of gas and 8 bbl. of condensate per day through 16/64-in. choke. Sinclair's discovery well, 4-A OCS-O439, completed in pay at 9,272-78 ft., flowed 350 bbl. of 34.2°-gravity oil per day.

Both wells are in Block 190, southeast of Block 188 being developed by Shell Oil Co., and east of Block 191 being developed by Phillips Petroleum Co. El Paso Natural Gas Co., Sohio Petroleum Co., and Peoples Production Co. are joint operators with Sinclair.

Rockies meet set

THE Rocky Mountain section of the AAPG will hold its ninth annual meeting in Albuquerque, February 1-4, 1959.

The theme of the meeting will be "Sedimentary Controls for Future Oil and Gas Discoveries in the Rocky Mountains." The 3 days of technical sessions will see presentation of more than 30 new papers concerning the source, migration, and accumulation of oil in every portion of the Rocky Mountain region from western Canada to New Mexico.

In addition, there will be discussions of various recently developed oil fields in different provinces of the Rocky Mountain region. The oil-field papers are restricted to new fields illustrative of controls affecting more recent discoveries in the Rocky Mountain area.

Anadarko basin gets new field

NORTHWESTERN OKLAHOMA'S Ellis County has another Pennsylvanian gas pool.

Pan American Petroleum Corp. 1 Herndon in C SE NW 35-24n-24w, between Northeast Catesby and Southwest Fort Supply fields, flowed 2,570 M.c.f.d. of gas on a 1-hour drill-stem test in the Morrow sand at 7,990-8,015 ft.

Heath discovery stirs Montana

A NEW DISCOVERY has been made at 1-11 Stensvad well, located in 11-11n-31e, Rosebud County, Montana, by Honolulu Oil Corp.

Two separate sands in the Heath formation of Mississippian age have yielded oil on formation tests. Twenty-five feet of sand from 5,211-36 ft. yie'ded a recovery of 510 ft. of 30°-gravity oil and 360 ft. of heavily oil-cut mud. Forty feet of the second sand have been penetrated at the present depth of 5,367 ft. A test of the top 9 ft. of the sand from 5,327-36 ft. flowed gas and oil to the surface in 30 minutes, and flowed 33°-gravity oil at an undetermined rate for 1 hour and 20 minutes. The well is now coring ahead in oil sand. The company holds approximately 3,200 acres in the immediate area.

Successful Wildcats

CALIFORNIA

Los Angeles County: Signal Oil and Gas Co. 1 Signal-Richfield-Community, NE SW 25-1s-15w, 600 BOPD, 23° gravity, 375 M.c.f., perfs. in 750 ft. interval at about 6,800 ft., TD 8,816 ft. New pool discovery adjoining 20th Century Fox movie lot in West Los Angeles. Wildcat was slant-drilled from Hillcrest Country Club.

Santa Barbara County: Standard Oil Co. of California, 1 Standard-Humble Summerland State, 2.2 miles offshore, 865 BOPD, 36° gravity, TD 7,531 ft. New field discovery on 5,500-acre offshore parcel.

WESTERN CANADA

Saskatchewan: Eide 15-12 Crown, LSD 15, 12-5-12w2. Midale oil discovery. TD 5,122 ft.

United Canso 11-2 North Hoosier, LSD 11, 2-32-28w3. Viking oil discovery. TD 2,350 ft.

British Columbia: Phillips 4 Kobes, unsurveyed territory. Cadomin gas discovery. TD 5,708 ft.

LOUISIANA OFFSHORE

South Pass Area: Rimrock Tidelands and Argo Oil Co. 1 State Lease 2716, Blk. 21, South Pass Area, Gulf of Mexico. IP 5,150 M.c.f.d., 19/64-in., dry gas, TP 2,500 psi., perf. 9,720-25 ft. TD 9,855 ft. New pay in South Pass Blk. 20 field.

SOUTH LOUISIANA

Cameron Parish: Hunt Oil Co. State Lease 2402, Calcasieu Lake. IP 400 BOPD, ½-in., 32°, perf. 11,834-38 ft. TD 14,054 ft. Discovery well on Calcasieu Lake Dome.

Jefferson Parish: Lone Star Producing Co. 1 State Lease 2705, Township 16s-22e, in Lake Salvador, 3 miles northeast of Lake Salvador field. IP 1,818 M.c.f.d. and 6 BOPD, $\frac{7}{8}$-in., 43.1°, TP 2,900 psi., perf. 11,620-30 ft. TD 12,040 ft. New field.

Lafourche Parish: Pan American Petroleum Corp. 1 State Lease 3258, Township 22s-21e, in Timbalier Bay. IP 332 BOPD and 52 M.M.c.f.d., ¼-in., 48.7°, TP 5,000 psi., perf. 14,908-22 ft. and 14,954-64 ft. TD 16,000 ft. New field.

EASTERN NEW MEXICO

Lea County: Forster Drilling Co. 1 Federal, 25-19s-34e, 5 miles southwest of Pearl. IPP 52 BOPD, 29°, pay 4,084-97 ft. TD 5,105 ft., elev. 3,745 ft.

EAST TEXAS

Houston County: L. A. Douglas et al., 2 Lee Bridges, John Box Sur., A-207, 4½ miles southeast of Elkhart. IPP 25 BOPD, 40°, sub-Clarksville 5,920½-24½ ft. TD 5,950 ft. Discovery of Northwest Grapeland field.

NORTH TEXAS

Cooke County: C. C. Parfet et al., 12-B Bugg, J. Martin Sur., A-714, 6 miles northeast of Gainesville. IP 92 BOPD, 39°, lower Strawn 3,412-32 ft. TD 4,473 ft. New pay in Regular field.

SOUTHWEST TEXAS

Hidalgo County: Pan American Petroleum Co. 22 La Blanca Gas Unit, Lot 13, Block 94, Las Mestenas Ranch Subd., 2¼ miles northwest of La Blanca. AOF 592 M.c.f.d., GLR 68.2 M.c.f. per bbl., 57.8°, shut-in TP 2,287 psi., perf. 7,144-54 ft. TD 9,603 ft. New pay in La Blanca field.

TEXAS GULF COAST

Victoria County: P. W. Robinson 2-G Minnie S. Welder Estate, Felipe Dimmit Sur., A-21, 4 miles south of Victoria. IP 91.5 BOPD, 11/64-in., 23.4°, GOR 349 cu. ft. per barrel, TP 125 psi., perf. 3,505-12 ft., upper Frio-Greta sand. TD 3,600 ft. New pay in Lonnie Glasscock field.

SECOND DEEPEST WELL EVER DRILLED WAS DRILLED WITH POWER SLIPS

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VICE PRESIDENT

July 18, 1958

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Gentlemen:

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Sincerely,

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Here's an amazing advance in motor technology! It's the *Super-Seal* motor line—an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalies that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

Super-Seal motor superiority results from two distinct revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate a *Poxeal* stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

Find out more by reading the next pages; then contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

ALLIS-CHALMERS

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Two revolutionary insulating techniques developed and pioneered by Allis-Chalmers mean savings of millions of dollars for motor users . . .

New open motors are unaffected by moisture and contaminants

Modern insulating materials and new methods of application, now available in *Super-Seal* open-type motors, are drastically changing motor application standards. These insulations are so completely impervious to moisture and contaminants that *Super-Seal* open motors can be used in most applications formerly requiring costly enclosed designs. Existing applications have resulted in savings as high as 60%.

Basic insulation systems

Larger *Super-Seal* motors with form-wound stator coils use the *Silco-Flex* insulation system. Heart of this system is a remarkable rubber-like silicone elastomer, applied in semi-cured state and vulcanized to form a void-free, impervious dielectric barrier. More than four years of development and field testing have proven the superior electrical and physical properties of *Silco-Flex* insulation systems.

Stator coils of smaller random-wound motors are protected by equally effective *Poxeal* insulation system. A tough, durable case of epoxy resin completely seals the winding end turns and slot portions. Bonded to the stator laminations, it forms a seal completely impervious to contaminants.

Moisture resistance

In addition to being void-free, the silicone elastomer used in *Silco-Flex* insulation is moisture repellent. Even in high humidity, moisture does not form a surface film of condensation. Coils with this protection can operate completely immersed in water. In fact, one of the recommended cleaning procedures is use of detergent and water.

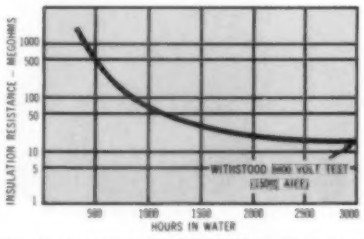


Fig. 1—Test curve shows insulation resistance of *Silco-Flex* insulation while immersed in water.

Moisture resistance of *Silco-Flex* coils is demonstrated in Fig. 1. After more than 3000 hours of total immersion with 2300 volts impressed on the coil, the test was terminated when it became apparent that little more drop could be expected in the coil's insulation resistance. At that point the coil still withstood a high potential test of 8400 volts without injury.

Encapsulated stator windings are equally well sealed. Motors with *Poxeal* insulation protection have been thoroughly tested under water while operating with full load and full voltage.

Resistance to contaminants

Silicone elastomers and epoxy resins are relatively inert to attack by practically all reactive agents. Further, the void-free construction of insulation systems used in *Super-Seal* motors prevents penetration of contaminants. As a result, *Super-Seal* motors are unaffected by oils, most acids, salt solutions, alkalies, and oils and are ideally suited for such applications.

Thermal stability

Temperature-wise, *Silco-Flex* insulation can easily withstand hot-spot temperatures of 200 C and more—

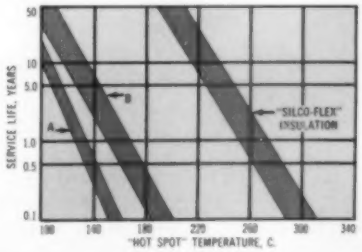


Fig. 2—Chart shows that *Silco-Flex* insulation more than meets Class H requirements.

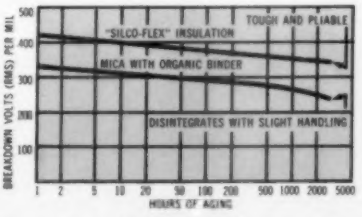
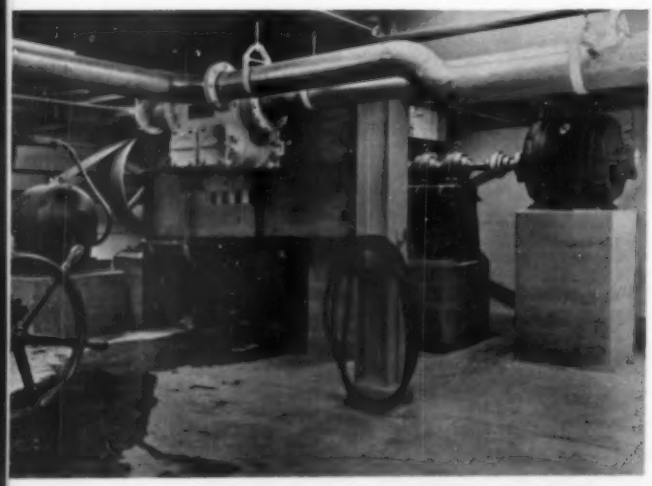


Fig. 3—Tests of 2300-volt insulated bars show thermal stability of *Silco-Flex* insulation.



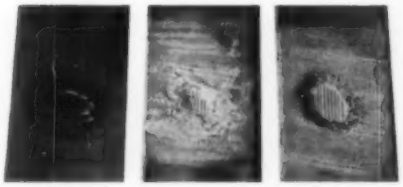
Paper mills have wide application for *Super-Seal* motors because of moist atmospheres.

easily meeting Class H temperature requirements (Fig. 2). At temperatures where the life of Class B coils would be measured in weeks, the life span of *Silco-Flex* coils is well beyond machine obsolescence.

Comparison with a mica-organic binder insulating system (Fig. 3) offers further proof of thermal stability. After 2000 hours of aging at 200 C with 8500 volts applied continuously, the *Silco-Flex* insulated coil was still tough, pliable, and completely serviceable. The mica-taped insulation had deteriorated to the point where it disintegrated readily and was completely useless.

An added advantage of *Silco-Flex* insulation is unusually high thermal conductivity — about twice that of conventional insulations. This means heat dissipates faster from its point of generation.

Poxeal insulation also demonstrates remarkably good thermal stability. Materials now in use are suitable for Class B temperatures, although actual classification of the insulation is determined by the basic material used.



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

Fig. 4—Samples of motor insulations after sandblasting give comparison of abrasion resistance.

Abrasion resistance

Resistance to abrasion is still another point of superiority in the insulation systems used for *Super-Seal* motors. Abrasion resistance of *Silco-Flex* insulation is compared to other types of insulation in Fig. 4. After one minute of sandblasting with 90-grit aluminum oxide and 100-psi air, only slight surface erosion appeared on the *Silco-Flex* sample. Other insulations were eroded to bare copper.

Application practices obsolete

The superior qualities of *Super-Seal* insulating systems, developed by Allis-Chalmers, make it necessary to reappraise present application practices. With virtually ageless insulation, *Super-Seal* motors assure more reliable service and require less upkeep than the best protected, conventionally insulated machines — and at considerably less cost.

Super-Seal, Poxeal, and Silco-Flex are Allis-Chalmers trademarks.

CHRYSLER KIMBERLY-CLARK GOODYEAR SOUTHERN CEMENT CONTINENTAL CAN SCOTT PAPER AMERICAN OIL CELOTEX HURON PORTLAND CEMENT FORD FIRESTONE PACIFIC GAS & ELECTRIC STANDARD OIL OF INDIANA B. F. GOODRICH DOW CHEMICAL MARLEY INGERSOLL-RAND LINK-BELT

WIDE ACCEPTANCE

of Super-Seal motors proves their advantages

Cement, petroleum, chemical, steel, mining, paper, utilities, municipalities and general industry — outstanding corporations in every field are specifying *Super-Seal* motors wherever operating conditions are tough.

Cost and *superior insulation* aren't the only reasons. Users are getting MORE MOTOR, too. Here's why:

Standard totally-enclosed motors, 55° C rise, have a *service factor of 1.* In other words, "nameplate" horsepower is the maximum. A 40° C rise *Super-Seal* motor with *Poxeal* insulation, and a 60° C rise *Super-Seal* motor with *Silco-Flex* insulation have a *service factor of 1.15.* For comparisons on what this difference means in required motor sizes, see this chart:

Rated Horsepower (Maximum Hp, TEFC)	Maximum Continuous Hp—Super-Seal Motor
15 hp	17.25 hp
25	28.75
40	46
75	86.25
125	143.75
200	230
350	402.5
500	575

Join the swing to *Super-Seal* motors. It will pay dividends fast. Contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

ALLIS-CHALMERS

SOUTHERN CALIFORNIA EDISON LONG ISLAND LIGHTING AVCO UNION BAG UNIVERSAL ATLAS UNION CARBIDE OHIO OIL INTERNATIONAL PAPER SOUTHERN PACIFIC PIPE LINE ALCOA ROHM & HAAS ARMOUR SHELL OIL COMMONWEALTH EDISON OWENS-ILLINOIS WYANDOTTE CHEMICAL BETHLEHEM STEEL ALLEGHENY-LUDLUM MEAD DU PONT DETROIT EDISON ESSO HERCULES POWDER SINCLAIR PIPE LINE GENERAL TIRE MONSANTO

This *SUPER-SEAL* MOTOR application SAVED $3000!

Find out how much you can save

This application of a *Super-Seal* open-type motor — in place of a weather-protected design of the same rating — *saved the user $3000.00!*

You can achieve similar savings! Fill out the data sheet below and *find out for yourself how much you can save — on a "no-strings-attached" basis.*

Here's what to do: 1) Select an enclosed motor application in your operations (a new motor need or, for comparison, a motor just purchased); 2) fill out the data sheet; 3) mail to the address shown.

We'll give you a cost quotation on a *Super-Seal* open motor for that application.

Fill out this data sheet—

no strings attached—to find out how much you can save on a new motor or on an existing motor installation

To: **ALLIS-CHALMERS**
888 S. 70th St., Milwaukee 1, Wis.

Motor Data

1. Type (i.e., squirrel cage):
   Horizontal ☐ Vertical ☐
   Hp..... Rpm.....
2. Phase..... Frequency.....
   Voltage.....
3. (For synchronous only)
   Power factor.....
   Starting torque.....
   Pull-in torque.....
   Pull-out torque.....

Application Data

4. Description of application:
5. Drive: Direct-connected ☐
   V-Belt ☐ Other:.....
   Starting load.....
   Ambient temperature.....

6. Operating conditions:.....
   Dirty ☐ Clean ☐ Wet ☐ Dry ☐
   Other.....

Information on Existing Motors
(for comparison)

7. Type of insulation
   Type of enclosure
   Time rating.....
   Temperature rise.....
   Bearings:
   Anti-friction ☐ Sleeve ☐
8. Special characteristics or construction:

NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

A-5869

ALLIS-CHALMERS

Paul Weaver

Pioneer Oil Man Is Honored

. . . for accomplishments during a colorful career dating back 50 years. Tribute paid to his service to mankind.

PAUL WEAVER of Houston is a pioneer geologist who has his roots in Brooklyn. But over the past half century his branches have spread throughout the oil world and made his name a by-word in the industry.

In recognition of his vital contributions to society, fellow oil men gathered in Houston last week to pay tribute to the 70-year-old Weaver—geologist, geophysicist, engineer, educator, citizen.

Weaver's vibrant life story would take a book to tell. It ranges from New York to Mexico, Siberia, and Texas. And his accomplishments cover a half dozen phases of the oil industry.

A pioneer who entered the business at a time when specialization was the exception, not the rule, he soon learned that in addition to being a geologist he might be drilling a well or running a railroad.

Weaver, born in Kentucky in 1888, moved as a boy with his family to New York, where he attended Brooklyn schools and then Columbia University as a geology major. He also studied ancient languages. His knowledge of Greek later helped him understand Russian during a secret job he performed during World War I.

In 1908, Weaver went to work for the U. S. Coast and Geodetic Survey and the U. S. Geological Survey.

Into oil . . . His first direct contact with the oil industry came in 1910 when he joined Bermudez Corp. and did pioneering geology in Trinidad and Venezuela.

A bout with blackwater fever sent him back to New York. But he whipped the disease and in a short time began a 15-year association with the old Mexican Eagle Oil Co.

To say he rose from geologist to general superintendent of the production department would be a dull way of telling what Weaver did in Mexico. What happened while on his way up is a better story.

For example, there's the time he brought in three wells with cable tools in the Tampico region. The tools blew out, but within 10 minutes Weaver and his crews had closed master valves on each one and had them under control. Within a month the three wells were producing 146,000 bbl. daily, and one of them produced 98,000 bbl. daily the first month.

For his accomplishment, Weaver was presented with a Tiffany watch bearing the names of the three wells. He probably uses the watch to this day.

Weaver did the first offshore drilling in Mexico. Using torsion balances he had introduced from abroad to locate the drill sites, he sank several wells on piles in the 20-ft. sea water of Tamiahua lagoon along Mexico's Golden Lane.

It was Weaver who also first introduced into Mexico seismograph instruments which had been used by the Germans and Austrians.

▶▶▶ Personals

When he wasn't looking for oil or drilling for it, he was doing such things as managing a 120-mile railroad to the oil fields or building bridges for it.

World War I took Weaver out of Mexico for a spell. The British Government sent him on an undercover mission to Eastern Siberia and Japan where he made studies of prospective bases for refueling and repairing of British warships.

In 1926, Weaver came back to the U. S. for good and began a 27-year stint with Gulf Oil Corp. at Houston. He directed geophysical operations for the widespread Gulf operations in the U. S., and it was no exceptional month when he logged 6,000 to 8,000 miles moving through the vast oil patch. He was technical assistant to the vice president before his retirement in 1953.

What next? . . . Retirement for Paul Weaver simply meant changing jobs.

He has hurled himself into a variety of new work. His principal interest is a part-time teaching post with Texas A. & M. college, where, under the title of "Distinguished Professor," he passes along his broad knowledge of the oil business to young men who follow in his footsteps.

"It's wonderful to see how these boys respond," he says with an enthusiasm matching that of his pupils.

Though a little hefty now, he moves easily on his 5-ft., 4-in. frame, and he can warm up quickly to the subject of education and the importance of broad learning for those entering the oil business.

Because of his knowledge of underground fluids, Weaver has become an expert on water and conservation.

Last spring Weaver was awarded the Sidney Powers Memorial Medal by the American Association of Petroleum Geologists for "distinguished and outstanding contributions to, or achievements in, petroleum geology."

Last week he received perhaps a greater honor—an old-fashioned testimonial dinner by the Houston chapter of the American Petroleum Institute and the Gulf Coast Section of the Society of Petroleum Engineers of AIME.

Though he has served as president of the American Association of Petroleum Geologists and the Society of Exploration Geophysicists, the meeting last week was not so much a recognition for past services to the industry's organizations as it was a tribute to a man who has served all mankind well.

Personals

Eugene J. Houdry, founder of Houdry Process Corp. and Oxy-Catalyst, Inc., has been awarded the Perkin Medal of the Society of Chemical Industry, one of the nation's top chemical awards. Houdry is presently with Oxy-Catalyst. An outstanding authority on catalysts, Houdry will be honored for his contributions to catalytic cracking. The award will be made at the annual Perkin Medal Dinner, January 9, in New York.

Forrest S. Elleman, assistant to the manager of Pure Oil Co.'s general engineering department, has moved up to manager. He succeeds **W. Dean Kinsell,** who will continue as an engineering consultant. Elleman joined Pure in 1947 as an electrical engineer. He became assistant to Kinsell earlier this year. Kinsell joined Pure in 1924. He was chief engineer, refining, before becoming manager of the engineering department in 1951.

REEVES

E. Duer Reeves, executive vice president of Esso Research & Engineering Co., has been elected executive vice president of Esso Standard Oil Co. This post has been vacant since August 1 when **William Naden** was named president of Esso Standard. Reeves also becomes vice chairman of the executive committee and a director of the refining company. Reeves had been executive vice president of Esso Research since 1949. He was active in the company's development of fluid catalytic cracking and butyl rubber. He has been with Standard Oil Co. (N. J.) companies since 1930.

George B. Randels, assistant general superintendent of Interstate Oil Pipe Line Co. in Shreveport, La., has retired. Randels joined Oklahoma Pipe Line Co., predecessor of Interstate, in 1918. He served in many capacities for the company, including chief station engineer, district foreman, district superintendent, division superintendent and assistant division manager. He became assistant general superintendent for the company in 1955.

Russell Holecek, Jr., research technologist with Shell Oil Co., has been transferred to the Houston refinery from the Martinez, Calif., refinery.

J. Reid Jackman, formerly with DX-Sunray Oil Co. in Duncan, Okla., has joined Ethyl Corp.'s research laboratories in Detroit in the refinery technology division. Jackman is a graduate of the University of Tulsa.

Michael S. Crowley has been named project supervisor in the materials division, engineering research department, at Whiting, Ind., laboratory of Standard Oil Co. (Ind.). Crowley has been with Indiana Standard since 1953. He recently was on leave of absence to receive a doctorate in geochemistry at Pennsylvania State University.

Larry C. McGuire, engineer at Shell Oil Co.'s Martinez, Calif., chemical plant, has been promoted to senior engineer at the Shell Point plant, Pittsburg, Calif. **G. C. Philbrook,** technical assistant at Shell Point, has been named chemist. **Robert G. Heap** has joined the Shell Point plant as chemist.

J. F. Dyer has been named division geologist in charge of new areas for Apache Oil Corp. Dyer recently joined Apache. He was formerly Rocky Mountain area exploration manager for Anderson-Prichard Oil Corp. Apache plans to expand its operations in the Rocky Mountains in 1959.

John Debold, foreman at Cities Service Gas Co.'s Guymon, Okla., station, has been named Petrolia, Kans., superintendent. He succeeds **Chauncey S. Smith,** who has retired. **Guy Neal,** production engineer in Medicine Lodge, Kans., will succeed Debold at Guymon. **John Inge,** construction superintendent during building of a new compressor station at Independence, Kans., has been named station superintendent there. **George Peters,** former Independence superintendent, has retired. **Don LaMont,** station superintendent at Hazelton, Kans., has been named superintendent of the Drumright, Okla., compressor station and pipeline division. He replaces **Oscar Bowen,** who has retired. **Joe Barker,** foreman at Guymon, will succeed LaMont as Hazelton superintendent. Barker will be suceeded by **Marvin Moore,** foreman at Mooreland, Okla. **Cyrus Starns,** foreman at the Hesston, Kans., station, has been transferred to Mooreland to replace Moore. New Hesston foreman is **Don Warfield,** who moves from the Joplin, Mo., station.

Robert A. Shapiro, mechanical engineer with Shell Oil Co., has been named development engineer in the Denver area office.

E. E. Aine, assistant superintendent at The Texas Co.'s Los Angeles refinery, has been appointed superintendent. He succeeds **W. J. Ryan,** who has retired. **George Louis,** supervisor of the crude-still area at the Los Angeles works, will succeed Aine as assistant superintendent there.

McFARLAND

Paul W. McFarland, exploration manager of Sun Oil Co.'s Latin America production division, has been named division manager. He succeeds the late Benton E. Warren. **Lee C. Smith,** chief geologist in the division, will succeed McFarland as exploration manager. McFarland joined Sun in 1923 in Venezuela. He was at one time assistant geologist in Sun's southwestern U.S. production division. He was named chief geologist for the company's new Latin America division in 1956 and manager of exploration earlier this year. Smith joined Sun in 1933. He was assistant chief geologist for the Latin America division before moving up to chief geologist.

Jerald B. Post, superintendent of production measurement for Texas Illinois Natural Gas Pipeline Co., has been promoted to superintendent of measurement for Natural Gas Pipeline Co. of America, an affiliate. Post will move to Fritch, Tex., from Houston. **R. R. Van Kerrebrook,** measurement engineer in West Columbia, Tex., for Texas Illinois, will succeed Post as superintendent of production measurement. Both companies are subsidiaries of Peoples Gas Light & Coke Co.

Samuel G. Baker, general manager of the organic chemicals department for DuPont, was elected president of Synthetic Organic Chemical Manufacturers Association at the group's annual meeting last week in New York. Other officers include **Carl A. Gerstacker,** Dow Chemical Co., first vice president; **Chester M. Brown,** National Aniline division of Allied Chemical Corp., second vice president, and **James A. Singmaster, Jr.,** Monsanto Chemical Co., treasurer. **Thomas C. Keeling, Jr.,** Koppers Co., Inc., and **C. Kenneth Egeler,** Sherwin-Williams Co., were newly elected board members.

▶▶▶ Personals

HICKMAN

T. B. Hickman, manager of oil movements for Gulf Refining Co., has been elected a vice president of the company and appointed manager of operations. He succeeds **Walter Shannon,** who recently was named director of pipeline engineering for Gulf Oil Corp. **S. O. Tostengard,** part interest executive and a director of the company, has been named coordinator of pipelines. **Fred McIntosh,** assistant chief dispatcher, will succeed Hickman as manager of oil movements. Hickman was with Humble Pipe Line Co. before joining Gulf in 1926. He served as chief dispatcher and was named superintendent of oil movements in 1952. Tostengard joined Gulf in 1949. He was assistant to the general manager, pipeline department, before becoming cost and economics supervisor and, later, part interest executive. McIntosh was with Magnolia Pipe Line Co. before joining Gulf in 1942.

Harold G. Teverbaugh, vice president of Texas Natural Gasoline Corp., has been elected a director of the company.

Paul J. O'Donnell, Jr., junior paleontologist in Shell Oil Co.'s Casper, Wyo., division, has been promoted to paleontologist.

A. J. Keller, geologist with Cities Service Oil Co., has been transferred to Billings, Mont., from Bismarck, N. D. Cities Service has closed its Bismarck office.

James C. Eley, Magnolia Petroleum Co.'s division geophysicist in Roswell, N. M., has been transferred to Midland, Tex., as division geophysicist. He succeeds **R. M. Nugent,** who has moved to Magnolia's headquarters in Dallas. Eley was division geophysicist in Palestine, Tex., before moving to Roswell. A graduate of the University of Oklahoma, he joined Magnolia in 1941.

H. C. Van Nouhuys, former corrosion and research engineer for Southeastern Pipe Line Co., has formed Corrosion Mitigation, Inc., with offices in Marietta, Ga. The company will design and engineer cathodic-protection systems for transmission, distribution, and industrial applications. A graduate of the University of Michigan, Van Nouhuys has been engaged in various engineering phases of pipelining since 1939.

D. I. Alspaw, engineer with Standard Oil Co. of Texas, has been transferred to Kermit, Tex., from Monahans, Tex.

W. W. Solter, Carter Oil Co. geologist, has been transferred to Tulsa from Elk City, Okla. **W. V. Snider,** geologist, has moved to Elk City from Oklahoma City.

J. R. Ellison, formerly process engineer at the Iraqi Government's Daura refinery, Baghdad, Iraq, has joined Pontiac Refining Corp. as chemical engineer in Corpus Christi, Tex.

Frank P. Troseth, geophysicist with Magnolia Petroleum Co. in Dallas, has been promoted to New Orleans division geophysicist. He succeeds **S. D. Blattner,** who has been transferred to Socony Mobil Oil Co., Inc., in New York. Troseth joined Magnolia in 1952 as a senior research technologist at the company's Dallas research center. He was named geophysicist in Dallas in 1957.

Frederick E. Merliss, assistant manger of Cities Service Research & Development Co.'s Tulsa production and exploration research laboratory, has been promoted to manager. **Bernard H. Rosen,** manager of product development at the company's Cranbury, N. J., laboratory, has been named manager of the Cranbury lab. Merliss joined Cities Service in 1953 as research engineer. He had been assistant manager in Tulsa since early 1957. Rosen has been with the company since 1947. He became assistant to the vice president of Cities Service Research & Development in New York in 1951 and manager of product development at Cranbury in 1957.

Earl C. Cockrum, Carter Oil Co.'s district geologist in Miles City, Mont., has been promoted to district exploration manager. **James P. Duncan,** geophysicist in Miles City, has been named district geophysicist. **Roy B. Strong,** formerly in Billings, Mont., has been transferred to Miles City as district geologist. **F. Lee Mackey,** district geologist for Carter in Minot, N. D., has been transferred to Liberal, Kans., in the same capacity. The Minot area office will close December 31. Moving from Minot to Miles City, will be **Dewey J. Bushaw,** geologist, and **William M. Baehr,** geophysicist. **Murray P. Dahill,** geologist in Miles City, has been named geologist in Riverton, Wyo. **C. H. Waldren,** geologist, has been transferred to Casper, Wyo., from Miles City.

J. H. Futrell and **A. R. Price** have joined Humble Oil & Refining Co.'s research and development division at Baytown, Tex.

S. J. Wright has been promoted to assistant superintendent of Wolf's Head Oil Refining Co.'s Reno, Pa., refinery. Wright has been with the company since 1949.

Alan Shivers, chairman of the board of Western Pipeline, Inc., and former governor of Texas, has been elected a director of Texas Gulf Sulphur Co.

J. D. McConnell, vice president and director in charge of crude lines for Sinclair Pipe Line Co., has been named vice president and director in charge of a newly formed economics and planning department. **Lewis B. Moon,** vice president in charge of products lines, has been placed in charge of crude and products lines. He is also

McCONNELL

MOON

a director of the company. Moon's appointment constitutes a reorganization and consolidation of Sinclair's crude and products systems. Both McConnell and Moon will headquarter in Independence, Kans. **J. A. Jackman,** executive assistant, has been named assistant to McConnell in the new economics and planning department. The changes are effective January 1.

C. I. Bigelow, operations superintendent at Esso Standard Oil Co.'s Bayway refinery, Linden, N. J., has been named deputy manager of manufacturing for Esso, A.G., in Hamburg, Germany. **W. J. Sheridan,** administrative superintendent at Bayway, will succeed Bigelow as operations superintendent. Sheridan will be replaced by **Fred C. Westphal, Jr.,** head of the business-service department. **John Cogan,** head of the technical department, will succeed Westphal as head of business service. **J. E. Gardner,** head of the New York manufacturing department's technical division, has been transferred to Linden as head of the technical department.

Personals

Marshall R. Joy has been named vice president in charge of operations for An-Son Drilling Co. **B. D. McCampbell** becomes vice president in charge of contracts. Joy joined An-Son in 1955 after serving as Michigan

JOY

McCAMPBELL

manager for Brazos Oil & Gas Co., subsidiary of Dow Chemical Co. Joy entered the oil business with the Cities Service companies. He later was supervisor of drilling and production for Toklan Production Co. During World War II he worked with the Petroleum Administration for War as assistant director of production for District 2. McCampbell was contract drilling engineer with Kerr-McGee Oil Industries, Inc., for 12 years before joining An-Son. He is a graduate of the University of Oklahoma.

George W. Isensee, division geophysicist in Houston for Magnolia Petroleum Co., has been promoted to area geophysicist and transferred to Dallas. **Graves E. Noble,** formerly in Dallas, will succeed Isensee in Houston. Isensee joined Magnolia in 1941. He had been Houston division geophysicist since 1956.

Dr. G. G. L. Henderson has been named senior structural geologist on the staff of California Standard Co.'s chief geologist. Henderson has been with the company since 1953. He will headquarter in Calgary.

C. Haines Finnell has been named manager of retail marketing for Union Oil Co. of California. He will be succeeded as director of public relations and advertising by **Jerry Luboviski,** formerly with Western Oil and Gas Association.

K. M. Simpson, British American Oil Co., Ltd., has been elected president of the Western Canada Oil Scouts Association. Other officers are **B. G. Freeborn,** Union Oil Co., vice president; **John Kozak,** Skelly Oil Co., secretary; and **D. J. Manning,** California Standard Co., treasurer. **Fred Morris,** Honolulu Oil Corp., is editor of the group and **G. M. Scott** is assistant editor. **J. C. Orman,** Plymouth Oil Co., is outgoing president of the group.

R. G. Reese, manager of Kern County Land Co.'s Canadian district office in Calgary, has been named manager of exploration at the company's San Francisco headquarters. **R. E. Horton,** geologist in Bakersfield, Calif., has been transferred to Jackson, Miss., as district geologist in the company's new office there. KCL recently announced plans for a new exploration program in Mississippi. **W. F. MacDonald,** formerly geologist for Hudson's Bay Oil & Gas Co. in Edmonton, has been named KCL representative in Calgary.

W. E. Ferguson, vice president in charge of production for Ohio Fuel Gas Co., will retire January 1.

Carl F. Aten, Jr., has joined The Texas Co. as chemist at the company's Beacon, N. Y., research center.

Floyd T. Stevenson, measurement engineer with Transcontinental Gas Pipe Line Corp., has been transferred to Thibodaux, La., from Anderson, South Carolina.

George P. Olsen has joined the staff of the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). He will work with pilot-plant studies of petrochemical processes.

BROWNE

J. J. Browne, special assistant in General Petroleum Corp.'s Los Angeles office, has been named Rocky Mountain division superintendent. He succeeds **Aldon L. Hair,** who has retired. **P. M. Barry** has been named to succeed Browne in Los Angeles. **W. G. Christensen** has been named manager of joint venture operations in Los Angeles.

Dr. Merrell R. Fenske, director of the Petroleum Refining Laboratory of Pennsylvania State University, has received a Certificate of Appreciation from the Pennsylvania Grade Crude Oil Association. The Penn State lab has had a research relationship with the Penn Grade Association since 1928.

Deaths

Harold R. Park, 59, of Tulsa and Bartlesville, Okla., died November 28 at his Bartlesville home after a heart attack. Park was chief of the refining division of Cities Service Oil Co. at Bartlesville before retiring in 1956. A mechanical engineering graduate of Stanford University, Park joined Cities Service in 1925. He was a project engineer before becoming chief of the refining division.

A helicopter leased by Shell Oil Co. crashed in the Gulf of Mexico last week and killed two Shell employes, a Coast Guard officer, and the pilot. Those killed were **I. J. Hebert,** 40, lease foreman for Shell, Jeanerette, La.; **R. M. Leomine,** 36, Shell mechanic, Morgan City, La.; **Lt. Donald E. Greenamyer,** 31, U. S. Coast Guard, New Orleans; and **Robert McCann,** pilot for Petroleum Helicopters, Inc., Morgan City. The plane was returning from a company production platform in Block 82, East Cameron area. Its destination was Cameron. Cause of the crash was not immediately known.

Carl L. Lea, 51, economist with Skelly Oil Co. in Tulsa, died December 2 in a Dumas, Tex., hospital. He suffered a heart attack several days before while visiting relatives in Dumas. Lea had been with Skelly since 1925.

Ernest W. Koester, 63, retired Bartlesville, Okla., independent producer, died November 28 at his home in Bartlesville.

Martin Thompson, 80, pioneer Texas independent operator, died November 30 in Houston. He had suffered a stroke several days before while on a fishing trip in Galveston Bay. Thompson was president of Powers Production Co. for many years. He was credited with development of Markham field near Bay City, Tex.

Charles W. (Todd) Allison, 71, managing partner of Triangle Oil & Refining Co. and a director of the Independent Refiners Association of California, died November 26 in a Los Angeles hospital.

Walter M. Switzer, 52, foreman with Quaker State Oil Refining Corp., died December 1 in Oil City, Pa. He had been ill for several months.

Distillate plays the lead in December

BY JOHN C. CASPER

CHANGES in oil activity for the month of December tend to center around sales and production of distillate fuels, and weather is a big factor in distillate sales.

Domestic demand for middle distillate for the month may be as much as 73% higher than the average for the year. The smallest margin for the past 10 years was the 38% reported for 1956.

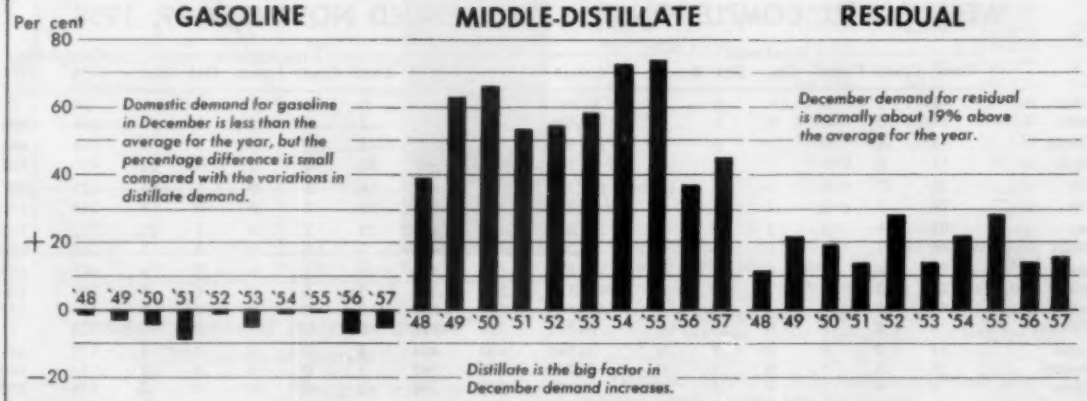
Stock decreases for the month have ranged from 10,000,000 bbl. in 1948 to 37,000,000 bbl. in 1955. Keep your eye on distillate this month.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,002,550	UP	23,000	UP	170,342
Crude stocks	256,294,000	DOWN	298,000	DOWN	26,845,000
Completions	1,069	UP	101	UP	170
Refinery runs	7,785,000	DOWN	95,000	DOWN	22,000
Gasoline stocks	173,600,000	UP	4,024,000	DOWN	11,603,000
Kerosine stocks	31,932,000	DOWN	223,000	DOWN	729,000
Distillate stocks	161,439,000	DOWN	976,000	DOWN	6,155,000
Residual stocks	66,199,000	DOWN	420,000	UP	7,392,000
Four-product stocks	433,170,000	UP	2,405,000	DOWN	11,095,000
Total imports	1,499,500	DOWN	233,500	UP	153,900

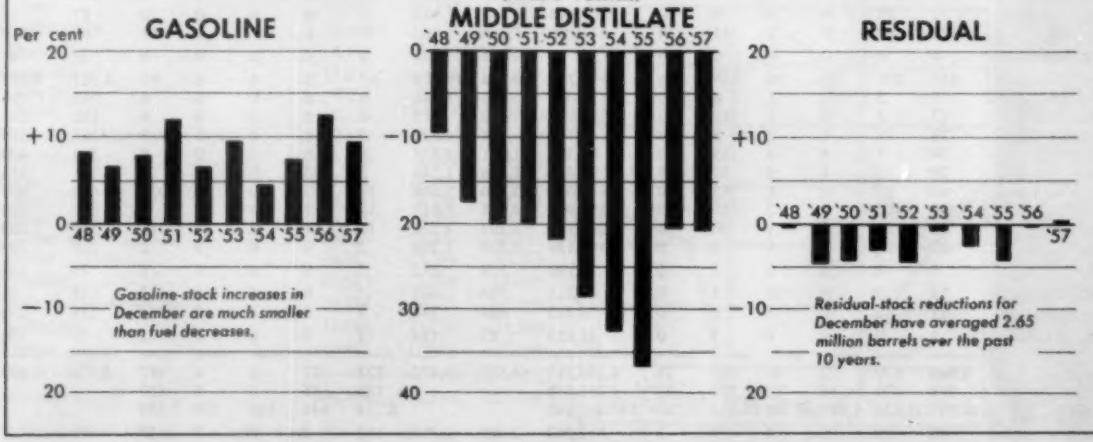
DECEMBER DEMAND VS. YEAR'S AVERAGE

(Percentage Difference)

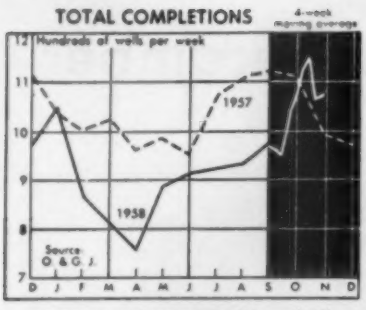

Per cent
GASOLINE
MIDDLE-DISTILLATE
RESIDUAL
80
60
40
+20
0
−20
'48 '49 '50 '51 '52 '53 '54 '55 '56 '57
Domestic demand for gasoline in December is less than the average for the year, but the percentage difference is small compared with the variations in distillate demand.
December demand for residual is normally about 19% above the average for the year.
Distillate is the big factor in December demand increases.

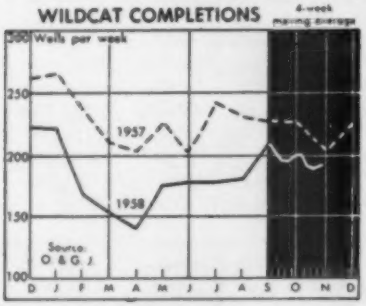
DECEMBER PRODUCT STOCK CHANGES

(Millions of Barrels)



DRILLING





Active Rotary Rigs*

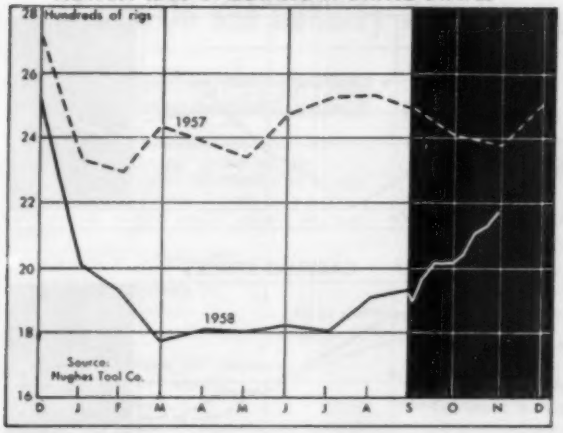
	12-1-58	11-24-58	12-2-57
Alabama	12	13	6
Arkansas	28	26	28
Arizona	1	1	1
California	88	88	98
Colorado	28	25	44
Florida	1	1	2
Georgia	....	....	....
Illinois	57	58	54
Indiana	8	7	8
Iowa	3	3	2
Kansas	141	136	152
Kentucky	8	8	9
Louisiana	337	327	370
North	44	40	41
S.-Inland Waters	151	140	(‡)
S.-Land	100	105	250
Offshore	42	42	79
Maryland	1	1	1
Michigan	14	13	11
Missouri	2	2	....
Montana	26	22	34
Mississippi	54	57	37
Nebraska	17	21	25
Nevada	....	....	....
New Mexico	111	107	158
New York	1	1	1
North Dakota	32	27	46
Ohio	5	5	1
Oklahoma	247	253	265
Oregon	....	....	....
Pennsylvania	10	10	9
South Dakota	....	....	2
Texas	822	804	903
S.-Inland Waters	8	8	(‡)
S.-Land	153	150	174
Offshore	....	1	5
North-East	188	174	(†)
West Central	296	293	(†)
West	177	178	(†)
Utah	40	41	56
Washington	1	1	1
West Virginia	2	3	4
Wyoming	82	77	65
Virginia	....	....	....
Total U. S.	2,179	2,138	2,393
Western Canada	176	165	175
Eastern Canada	....	3	2
Grand total	2,355	2,306	2,570

*Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.

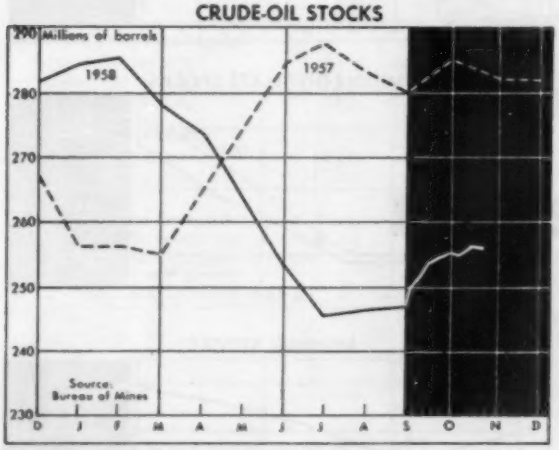
WEEKLY WELL COMPLETIONS . . . WEEK ENDED NOVEMBER 29, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	1	1	0	0	0	0	11,407	70	72	0	0	0	0	0	26	25
Arkansas	16	10	0	0	6	0	47,476	736	1,016	2	0	0	0	2	148	190
California	24	16	0	0	8	0	126,997	1,377	2,050	7	2	0	0	5	339	484
Colorado	11	0	0	1	10	0	57,263	777	785	10	0	0	0	10	450	508
Illinois	76	27	0	3	35	11	165,724	2,182	2,483	16	2	0	1	13	422	587
Indiana	24	7	0	0	17	0	37,037	792	636	10	2	0	0	8	288	121
Kansas	93	39	0	2	49	3	321,611	3,686	3,872	25	3	0	1	21	772	754
Kentucky	46	27	0	1	18	0	66,264	1,713	1,402	3	0	0	0	3	162	290
Louisiana	78	36	8	4	26	4	589,630	3,178	3,558	10	1	0	1	8	467	624
North	29	13	0	3	13	0	98,135	1,245	1,336	7	1	0	1	5	209	186
South	43	19	6	1	13	4	430,603	1,548	1,600	3	0	0	0	3	234	357
Offshore	6	4	2	0	0	0	60,892	385	622	0	0	0	0	0	24	81
Michigan	11	2	0	0	9	0	30,961	400	404	1	0	0	0	1	132	141
Mississippi	11	3	1	0	7	0	88,208	365	363	1	0	0	0	1	159	186
Montana	9	4	0	0	5	0	23,108	299	397	2	0	0	0	2	119	159
Nebraska	17	7	0	0	10	0	99,088	675	820	7	1	0	0	6	320	447
New Mexico	34	19	0	7	8	0	144,962	1,792	1,970	6	0	0	0	6	245	246
West	11	5	0	6	0	0	32,721	881	838	0	0	0	0	0	94	95
East	23	14	0	1	8	0	112,241	911	1,132	6	0	0	0	6	151	151
New York	4	2	0	0	0	2	2,703	487	428	0	0	0	0	0	41	9
North Dakota	9	5	0	0	4	0	75,087	419	273	0	0	0	0	0	129	120
Ohio	31	15	0	7	9	0	80,894	948	1,044	0	0	0	0	0	17	16
Oklahoma	121	69	0	5	43	4	414,220	5,764	5,765	19	6	0	0	13	789	689
Pennsylvania	0	0	0	0	0	0	0	528	571	0	0	0	0	0	19	41
Texas	415	231	13	14	153	4	1,598,791	16,494	19,775	95	3	1	0	91	3,325	4,652
District 1	9	2	0	1	6	0	27,016	893	1,141	6	0	0	0	6	345	397
District 2	17	3	2	1	11	0	114,974	680	715	6	0	0	0	6	180	242
District 3	23	12	1	2	8	0	143,778	1,168	1,524	3	0	0	0	3	265	419
District 4	20	3	4	0	13	0	89,356	1,051	1,275	9	0	1	0	8	314	403
East	20	8	1	0	11	0	93,413	1,114	1,246	5	0	0	0	5	301	351
District 7-B	80	25	1	1	53	0	199,024	2,300	2,698	38	1	0	0	37	634	909
West	119	100	0	2	17	0	550,964	4,715	5,611	10	1	0	0	9	641	794
District 9	95	58	2	1	30	4	240,127	3,353	4,271	16	1	0	0	15	529	1,033
District 10	32	20	2	6	4	0	140,139	1,220	1,294	2	0	0	0	2	116	104
Utah	5	4	0	0	1	0	29,192	359	231	1	0	0	0	1	77	117
West Virginia	21	3	0	13	5	0	61,313	705	635	2	0	0	1	1	18	30
Wyoming	11	2	0	3	6	0	56,635	684	798	5	1	0	0	4	233	278
Misc. (Alaska)	1	0	0	0	1	0	11,653	87	124	1	0	0	0	1	77	106
Total U. S.	1,069	529	22	60	430	28	4,140,287	44,517	49,472	223	21	1	4	197	8,774	10,820
Prev. week	968	471	16	71	378	32	3,751,839	.....	.....	182	16	4	5	157	.....	.....
Cum. 1958	44,517	21,926	1,017	3,348	17,014	1,212	180,402,102	.....	.....	8,774	844	141	239	7,550	.....	.....
Western Canada	58	39	0	5	14	0	302,502	2,269	2,765	13	2	0	1	10	599	787

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	11-22-58	11-15-58	11-23-57
Pennsylvania	2,825	2,824	3,196
Other Appalachian	1,665	1,674	1,795
Illinois, Indiana, Michigan	9,923	9,812	10,470
Nebraska and North Dakota	2,568	2,546	2,726
Kansas	10,412	10,393	10,884
Oklahoma	17,643	17,222	20,596
Arkansas	2,165	2,237	2,685
Louisiana	17,037	17,514	20,791
North	2,915	2,831	3,342
South	14,122	14,683	17,449
Mississippi, Alabama, Florida	2,630	2,366	2,956
New Mexico	8,590	8,578	9,571
Texas	111,090	109,583	125,765
East Texas	8,166	8,111	9,341
West Texas	54,291	53,054	55,547
Texas Gulf	20,118	19,824	26,218
Other Texas	28,515	28,594	34,659
Wyoming	13,515	13,524	14,037
Other Rocky Mountain	8,724	9,122	7,150
California	32,640	33,230	33,508
Foreign	†14,867	15,967	17,009
Total	**256,294**	256,592	283,139

*Bureau of Mines. †Includes 5,121,000 bbl. in California.

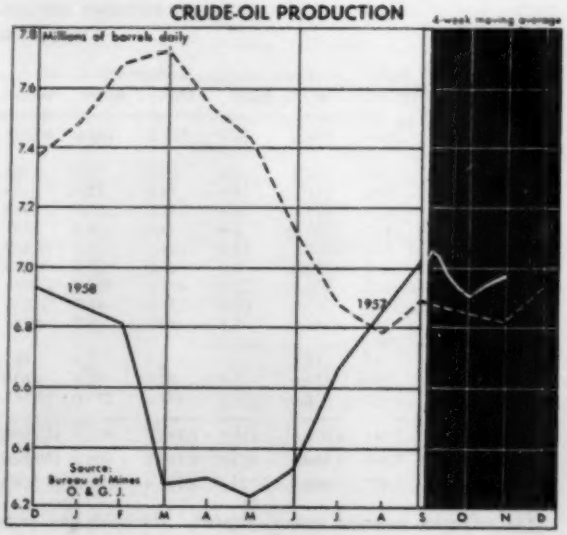
DAILY AVERAGE PRODUCTION FOR WEEK

	November 29, 1958 Crude oil	Lease condensate	Total	Nov. 22 total
Alabama	16,350	.....	16,350	16,425
Arkansas	79,950	100	80,050	79,900
California	855,800	.....	855,800	854,500
Colorado	131,400	.....	131,400	132,300
Eastern	44,500	.....	44,500	44,900
Florida	1,200	.....	1,200	1,200
Illinois	224,700	.....	224,700	227,000
Indiana	31,400	.....	31,400	31,600
Kansas	†335,000	.....	†335,000	†338,975
Kentucky	58,000	.....	58,000	57,600
Louisiana	825,950	93,275	919,225	919,925
North	109,950	3,950	113,900	114,600
South	716,000	89,325	805,325	805,325
Michigan	24,300	.....	24,300	25,700
Mississippi	115,750	4,700	120,450	120,450
Montana	77,900	.....	77,900	78,900
Nebraska	58,800	.....	58,800	59,100
Nevada	100	.....	100	100
New Mexico	278,000	6,100	284,100	284,100
North Dakota	32,300	.....	32,300	35,700
Oklahoma	†564,500	.....	†564,500	†577,500
Texas	2,675,000	62,700	2,737,700	2,737,700
Dist. 1	47,000	700	47,700	47,700
Dist. 2	117,000	8,000	125,000	125,000
Dist. 3	361,000	31,000	392,000	392,000
Dist. 4	196,000	7,500	203,500	203,500
Dist. 5	30,000	400	30,400	30,400
Dist. 6	119,000	6,800	125,800	125,800
East Texas Field	151,000	.....	151,000	151,000
Dist. 7-B	138,000	75	138,075	138,075
Dist. 7-C	141,000	3,825	144,825	144,825
Dist. 8	1,067,000	2,000	1,069,000	1,069,000
Dist. 9	207,000	1,500	208,500	208,500
Dist. 10	101,000	900	101,900	101,900
Utah	73,000	.....	73,000	22,000
Wyoming	331,600	.....	331,600	333,800
Others	‡175	.....	‡175	‡175
Total U. S.	6,835,675	166,875	**7,002,550**	6,979,550
Change from prev. week, up			**23,000**	
Canada	†478,949	.....	†478,949	†448,600

Total U. S. production—Jan. 1-Nov. 29 ..... 2,210,737,480 bbl.
Same period last year (crude plus cond.) ..... *2,396,246,906 bbl.

*Includes 46,784,315 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

CRUDE-OIL PRODUCTION



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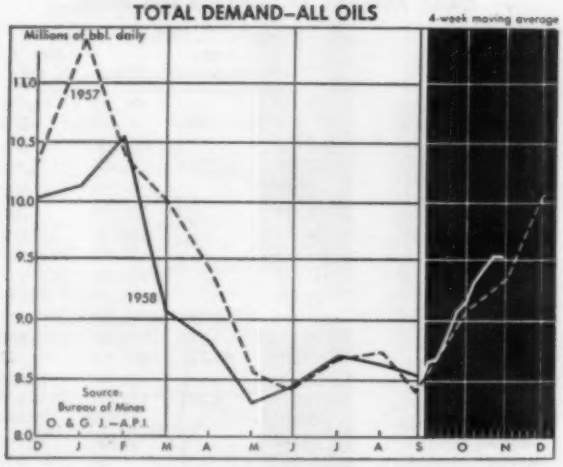
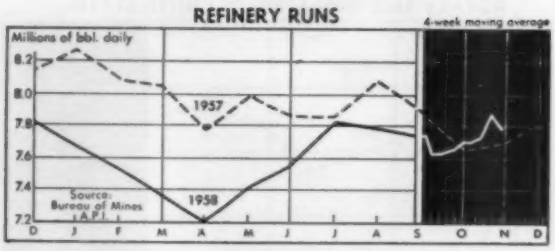
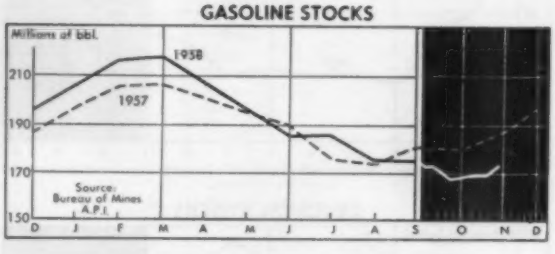
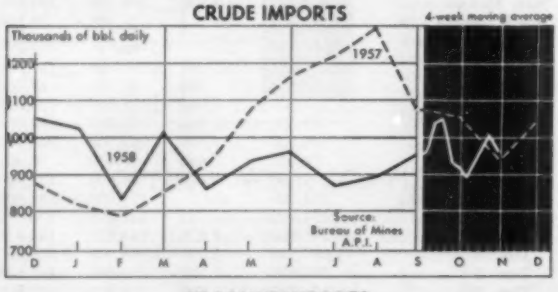
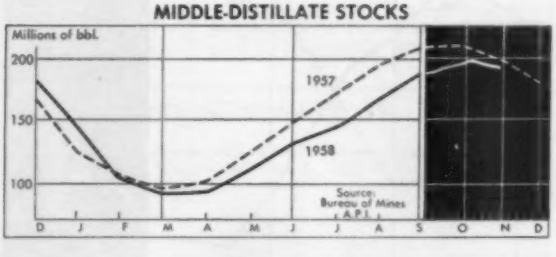
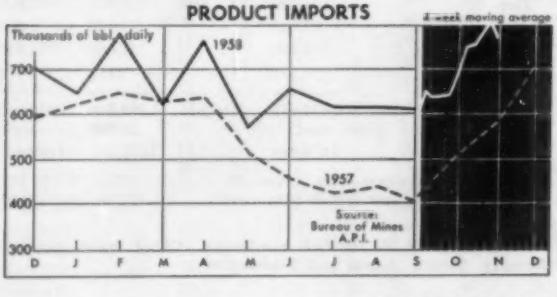


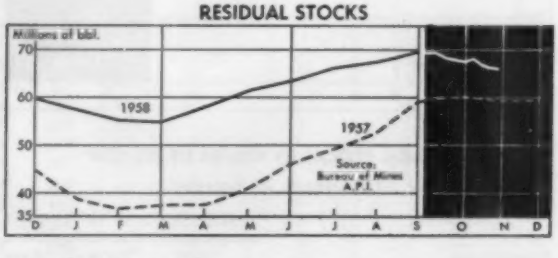












API REFINERY REPORT—NOVEMBER 28, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, November 1957 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,041	490.4	44.0	311.0	145.6	40,038	12,766	58,450	13,357	1,111	444.7	36.0	296.0	174.7
Appalachian:														
District 1	102	43.0	4.3	20.9	12.0	4,560	602	3,712	284	100	43.7	4.5	21.8	9.3
District 2	102	51.2	3.6	19.8	12.7	2,510	573	1,549	205	110	54.5	3.7	21.6	16.2
Ind., Ill., Ky.	1,428	759.0	58.1	331.0	165.7	29,853	7,927	30,327	5,466	1,441	726.6	73.4	306.5	185.5
Minn., Wis., Dak.	102	50.4	1.6	33.0	6.4	7,181	1,461	8,740	619	90	42.1	4.5	23.1	10.7
Okla., Kans., Mo.	719	394.1	13.6	184.0	20.4	15,659	1,746	13,206	1,024	693	393.1	13.2	170.6	37.2
Inland Texas	318	222.0	4.0	65.6	23.0	6,948	377	2,555	2,145	260	189.6	8.3	37.6	26.1
Texas Gulf Coast	1,805	906.2	121.1	475.6	191.4	23,814	3,143	16,549	7,108	1,737	876.5	123.6	429.0	196.8
La. Gulf Coast	679	382.0	62.4	177.4	40.7	10,636	1,909	6,939	1,493	615	348.6	36.7	158.7	42.5
N. La. and Ark.	59	44.4	1.3	20.1	4.0	4,187	721	2,596	118	96	39.2	8.6	18.5	6.4
Rocky Mountain:														
New Mexico	23	15.4	....	2.8	1.4	465	25	122	49	27	14.6	0.5	5.1	3.6
Other Rky. Mt.	280	133.6	3.8	62.9	33.4	4,630	303	2,862	1,025	275	133.8	4.2	67.7	36.8
West Coast	1,127	528.4	1.3	194.6	277.0	23,119	379	13,832	33,306	1,138	521.1	6.4	177.4	322.8
Nov. 28, 1958	7,785	4,020.1	319.1	1,898.7	933.7	173,600	31,932	161,439	66,199	7,693	3,864.1	323.6	1,733.6	1,068.6
Nov. 21, 1958	7,880	3,980.1	353.4	1,813.6	909.4	169,576	32,155	162,415	66,619	.....	.....	.....	.....	.....
Nov. 29, 1957	7,807	3,886.4	327.4	1,793.4	1,046.0	185,203	32,661	167,594	58,807	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.625
Premium (99 octane)	14.50-14.625
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.25
Regular (92 octane)	10.50
Premium (97 octane)	11.625
Premium (98 octane)	11.75
California (rack) (Los Angeles):	
Regular (88 octane)	12.25
Premium (94 octane)	13.25
Premium (98 octane)	14.25
Caribbean area (cargoes):	
Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00
Diesel oil (58 d.i. and above)	9.75
Distillate No. 1	9.75
Distillate No. 2	9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.375
Distillate No. 2	8.875
New York Harbor (barges):	
Kerosine 41-43	10.20-10.70
Distillate No. 2	9.70-10.20
Diesel fuel, 48-52 d.i.	10.30-10.70
Caribbean area (cargoes):	
Distillate No. 2	8.625-8.875

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank car	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.50
Gulf Coast (cargoes):	
Bunker C fuel	$2.00
New York Harbor (barges):	
Bunker C fuel	$2.37
Caribbean (cargoes):	
Bunker C	$2.00
California (rack):	
Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.52	....	$2.62	2.06
21-21.9	2.50	2.55	....	2.64	2.11
22-22.9	2.60	2.58	....	2.66	2.16
23-23.9	2.69	2.61	$3.44	2.68	2.21
24-24.9	2.78	2.64	3.46	2.70	2.26
25-25.9	2.87	2.67	3.48	2.72	2.31
26-26.9	2.96	2.70	3.50	2.74	2.36
27-27.9	3.06	2.73	3.52	2.76	2.49
28-28.9	3.11	2.76	3.54	2.78	2.54
29-29.9	3.16	2.79	3.56	2.80	2.59
30-30.9	3.22	2.82	....	2.82	2.63
31-31.9	3.27	2.85	....	2.84	2.67
32-32.9	3.33	2.88	....	2.86	2.71
33-33.9	3.38	2.91	....	2.88	2.75
34-34.9	3.44	2.94	....	2.90	2.79
35-35.9	3.49	2.97	....	2.92	2.83
36-36.9	3.55	3.00	....	2.94	2.87
37-37.9	3.60	3.02	....	2.96	2.89
38-38.9	....	3.04	....	2.98	2.91
39-39.9	....	3.06	....	3.00	2.93
40-44.9	....	3.08	....	3.02	2.95

*Top prices on other: Oklahoma (sweet) postings vary from $3.15 to $3.01 a barrel. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 9-30-58; East of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Ville Platte	3.30
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.66
San Joaquin, 41°-41.9°, Puerto La Cruz	3.25
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Las Piedras*	2.10
Bachequero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Ababan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (ATRS —12.5%)	$2.49
★ Gulf-U.S.N.H., dirty (ATRS —25%	2.14
★ Carib.-U.S.N.H., clean (ATRS —32.5%)	1.86
★ P.G.-U.K. dirty (USMC—72.5%)	3.00

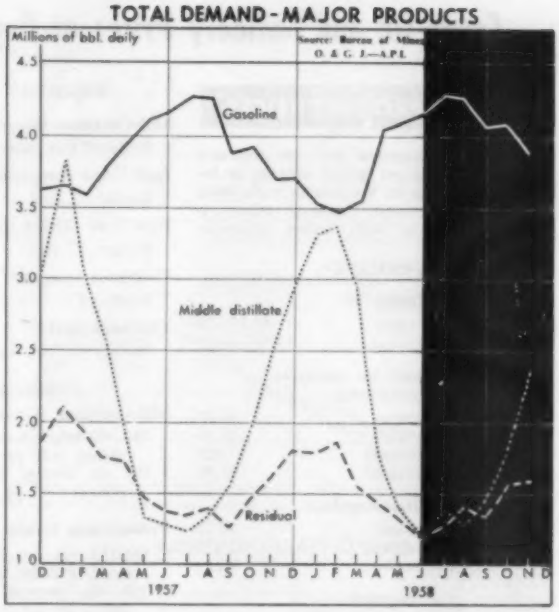
SELECTED MONTHLY DATA

SUPPLY AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

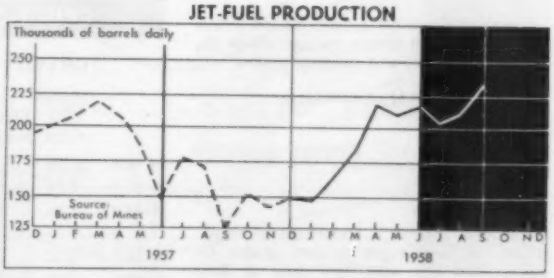
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
November 1958*	3,880	3,990	173,600
October 1958*	4,090	3,870	168,600
September 1958	4,104	3,978	175,337
December 1957	3,702	3,956	196,775
November 1957	3,701	3,864	187,140
KEROSINE			
November 1958*	350	335	32,000
October 1958*	290	325	32,100
September 1958	202	285	31,259
December 1957	474	356	29,200
November 1957	384	324	32,696
DISTILLATE			
November 1958*	2,035	1,830	161,500
October 1958*	1,465	1,785	166,000
September 1958	1,310	1,784	155,412
December 1957	2,474	1,886	149,450
November 1957	2,080	1,734	166,763
RESIDUAL			
November 1958*	1,580	945	66,200
October 1958*	1,560	990	67,100
September 1958	1,348	973	67,670
December 1957	1,805	1,142	59,960
November 1957	1,603	1,069	59,622

*Preliminary. †Thousands of barrels.

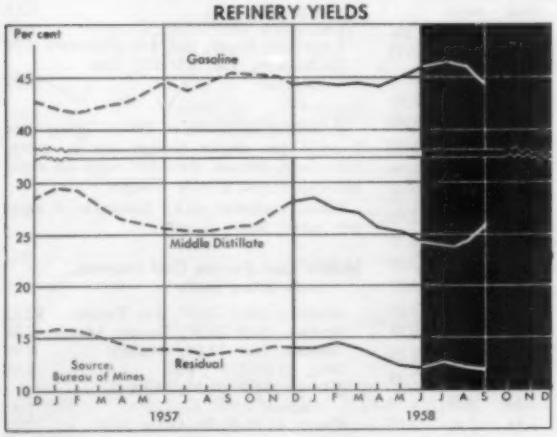
TOTAL DEMAND - MAJOR PRODUCTS



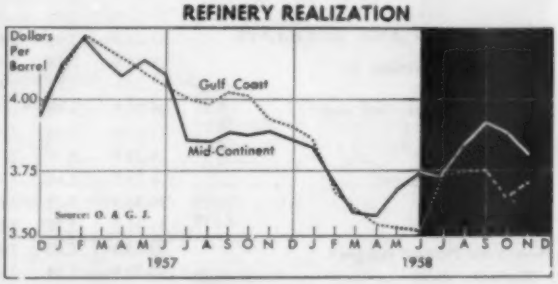
JET-FUEL PRODUCTION



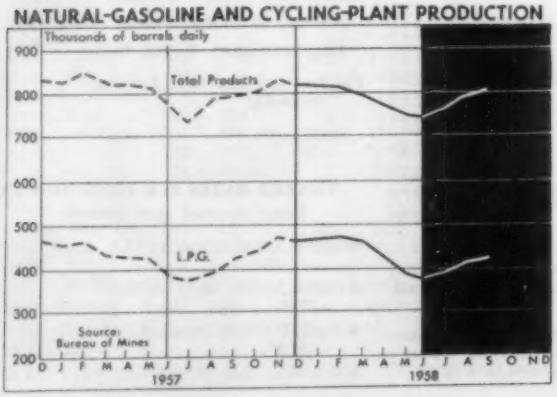
REFINERY YIELDS



REFINERY REALIZATION



NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



REFINERY REALIZATION

	Nov.* 1958	Oct.* 1958	Sept. 1958	Nov. 1957
Mid-Continent	$3.81	$3.87	$3.82	$3.88
Gulf Coast	3.71	3.66	3.71	3.93

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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4-6% Chr. Tube: 1000, 500 sq. ft.
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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 11.22 acres of land in one parcel within the known geologic structure of Greenwood Field, Baca County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., January 15, 1959, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. John L. Rankin, Manager.

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U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that approximately 48.5 acres of land comprising the Veterans Administration Center Reservation in Shreveport, Caddo Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 P. M., E.S.T., December 17, 1958, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Geological Survey's Oil and Gas Supervisor at 239 Federal Building, Tulsa, Oklahoma or the Conservation Division, General Services Administration Building, Washington 25, D. C., and from the Minerals Staff Office or the Eastern States Land Office, Interior Building, Washington 25, D. C., Edward Woozley, Director.

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FOR DRILLING DEALS in Texas, contact Ogden Oil Company, P. O. Box 464, Ph. LD 2-3352, Taylor, Texas.

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PERSONALS

PAN AMERICAN CONSULTANTS, a newly formed partnership specializing in oil and gas development in Latin America has opened offices in the Maryland Casualty Building in New Orleans, and the Ambar Motor Building in Havana, Cuba. The partnership is composed of John F. Bricker, Management; Fernando Freyre, Legal; James R. Crow, Geological.

BUSINESS OPPORTUNITIES

WANT ASSOCIATE for manufacturing and selling Lease Automatic Custody Transfer (Lact) and Desander equipment. Gulf Coast. W. Thomson—1342 Jones, San Francisco 9, Phone PRospect 5-3944.

ILLINOIS, MICHIGAN and OHIO territories now open for sales and service organizations to represent us in a complete line of production equipment. Our line of equipment fits in well with practically all production equipment service organizations. Commissions far above average. Box K-985, The Oil and Gas Journal, Tulsa, Oklahoma.

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IT CAN HAPPEN HERE

For years, we have been told that a real Oil Boom with spectacular lease prices just isn't in the cards for the Appalachian Basin.

Events in Green County, Kentucky completely refute this. The Boom is on—with 175 rigs drilling and lease prices skyrocketing to over $2,000 per acre.

We believe a similar situation is shaping up in Northeastern Ohio, where the lease situation has become very tight; where leading majors and independents, who know their way around in the Oil business, have already tied up several hundred thousand acres and where one operator has just run up a perfect score of six producers—no dry holes.

The time to pick up acreage is BEFORE a boom busts out all over. Acreage now available at LOW prices could command PREMIUM prices in 1959. Large and small blocks available.

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Weather fires up drilling in Alberta's Swan Hills

WINTER'S COLD in Alberta is stirring exploratory and development drilling. The discoverer and companies that are joining in on the development of Swan Hills, 125 miles northwest of Edmonton, are making this region the second busiest in the province.

Swan Hills, opened last year, is still in the early stages of development. Home Oil Co., Ltd., the discoverer, has embarked on a development-drilling program that is unique in Canadian oil history. Swan Hills marks the first time that an independent group has ramrodded the discovery and then continued as field operator. So far, Home et al., are the only ones who have completed an oil well in the field.

Deep drilling . . . Due to the deep drilling (below 7,500 ft.), and the hitherto inaccessible field location, operating companies were able to drill only one or two holes each season with each rig. The Swan Hills discovery well, No. 8-11, which lies a few miles northeast of present development, has not yet been put on production. Only two of the six other wells in the field are on production.

Pipeline . . . The field is now serviced with a line to Edmonton. Nine rigs are working on actual development wells; two others are working on wildcats. Home and associates have 9 of the 11 rigs working with another slated to begin soon. The only other firm with a rig working now is C. L. McMahon, Inc. The pipeline from the field, operated by Federated Pipe Line Co., is owned 50-50 by Home and McColl Frontenac.

. . . Home spent the summer preparing the field for winter drilling. Roads are in, rigs are ready, and the pipeline is in. First production tests were reported recently by Home at Swan Hills. Two producers rated maximum permissive rates of 490 bbl. daily per well. A net pay zone of 123 ft. was indicated at one well; 143 at the other. Production from this pair of wells is flowing into the transmission line at the daily rate of 900 bbl. The wells are the 4-20 and 11-19 Swan Hills. Reserves at Swan Hills are estimated at 3,220,000 bbl. proved developed; 15,600,000 bbl. proved, but not yet developed, and 52,500,000 bbl. probable additional.

. . . The nine field wells now drilling will be completed early this month. Home plans to shift its eight rigs to eight new drillsites and will continue its development program with at least 24 well completions this year.

New pool opens in Saskatchewan

SPELMAN PRENTICE, American independent oil operator, grandson of John D. Rockefeller, Sr., and son of Alta Rockefeller (Prentice), was successful in his first drilling attempt in western Canada.

The well, a wildcat test, was drilled in the general Alameda district of southeastern Saskatchewan and flowed, during production test at the rate of 68 bbl. of oil daily. It was drilled by this independent from Tarrytown, N. Y., on acreage acquired under farmout agreement from Imperial Oil, Ltd., through his consultant in Calgary, W. Howard Myers.

The well, K Spelman Prentice No. 1-22, was drilled on LSD 1, 22-3-3w2. It is 2½ miles southwest of the presently proved limits of the Alameda oilfield and 28 miles east-northeast of Estevan.

It was carried to total depth of 4,610 ft. and a 30-ft. interval was perforated in the production casing which was set to total depth. The well, during production test, produced at the rate of 7 bbl. per hour through restricted choke.

Late Field news

Canada gets oil at North Hoosier

AN OIL DISCOVERY in West Central Saskatchewan was announced by United Canso Oil & Gas, Ltd. On 1-hour drill-stem test of a thin zone at 2,300 ft., the well flowed estimated 33°-gravity oil at a 12-bbl. per hour rate through a ½-in. choke. Completion of the hole preparatory to production testing is now in progress. Formal well number is United Canso 11-2 North Hoosier.

The well is located on a 2,560-acre block which lies adjacent to sizable United Canso holdings in the Hoosier gas area. The property was recently acquired by farmout from Phillips Petroleum Co. which has retained a 5% gross overriding royalty thereon.

Ohio field expands

An extension to Ohio's Hanover field was announced by W. H. Bears et al. Their 1 Lewis Holbert, Lot 2—4th Qr., Perry Township, Licking County, fractured Clinton sand at 3,110-60 ft. and flowed 100 bbl. in an 8-hour test.

Minnelusa campaign grows in Wyoming

WYOMING'S Powder River basin continues to grab the exploratory news spot in the Rockies. Pennsylvanian discoveries and offset plans in the northeastern part of the basin control interest.

Pan American Petroleum Corp.'s discovery northeast of Moorcroft in Crook County flowed 62 bbl. in 14 hours from the Minnelusa. Pump is being installed. Location has been made for an offset to this new strike.

The big news of the week is True

Oil Co.'s indicated discovery 10½ miles west of Donkey Creek field in Campbell County. Recovery on drill-stem test of the Minnelusa was 2,700 ft. of oil on a 2-hour test.

East Kentucky wildcat completed

IN MARTIN County United Fuel's 6311 P. P. McCoy et al., an old well drilled deeper, failed to find commercial production. From previous depth of 2,845 ft., test was taken to a new bottom of 4,102 ft. Clinton sand, the hoped-for producing sand, was found from 4,058 to 4,080 ft. with no shows recorded. Well has been plugged to the original depth of 2,845 ft. and completed as a small gas well in the Devonian brown shale.

New drilling set for Panhandle pool

ANOTHER LOCATION in a new Hemphill County pool in the Texas Panhandle has been staked by Apache Oil Corp.

It is the 2 Mathers, NE SW SE Section 132, Block 42, H&TC Survey. The well will test the lower Morrow at 11,100 ft.

It offsets the pool opening well, the 1 Mathers, which was dually completed in the upper Morrow, 9,894 to 9,902 ft., and the lower Morrow 11,098-11,110 ft. The well tested 288 bbl. of oil a day from the upper zone and 476 bbl. per day from the lower.

Successful Wildcats

WEST CENTRAL TEXAS

Coleman County: LaGorce Oil Co. 2 C. V. Evans, Sec. 53, Blk. 1, GH&H Sur., 4 miles southwest of Valera. IP 144 BOPD, 18/64-in. choke, 37°, GOR 200, TP 60 psi., Overall sand 2,011 ft. TD 3,016 ft., PB 2,195 ft.

Haskell County: Ambassador Oil Corp. 1 R. W. Herren, P. H. Anderson Sur., A-3, 5 miles northwest of Haskell. IPP 96.7 BOPD, 41°, pay 5,082-86 ft., TD 5,448 ft.

Jones County: Ambassador Oil Corp. and Duffield & Billups 1 City of Abilene, BAL Sur. 7, 10 miles southeast of Hawley. IPP 56 BOPD, 39°, GOR 185, Tannehill 1,624-28 ft. TD 3,525 ft.

Red River Drilling Co. 1 W. D. Swann, Miley Sur. 281, 8 miles north of Trent. IPP 62 BOPD, 37°, GOR 200, pay 2,570-78 ft. TD 2,717 ft.

Palo Pinto County: Alan T. Strong et al., 1-D W. A. Gregg, Susan Latham Sur., A-281, 15 miles west of Graford. IP 10 M.M.c.f. gas. TD 4,228 ft. Shut in. Production information not available.

Taylor County: Fletcher Oil & Gas Drilling Corp. 1 Alvin P. Wozencraft. IP 168 BOPD, 19/64-in. choke, 45°, GOR 476:1, TP 270 psi., Strawn sand 4,868-76 ft. TD 5,051 ft., elev. 1,891 ft.

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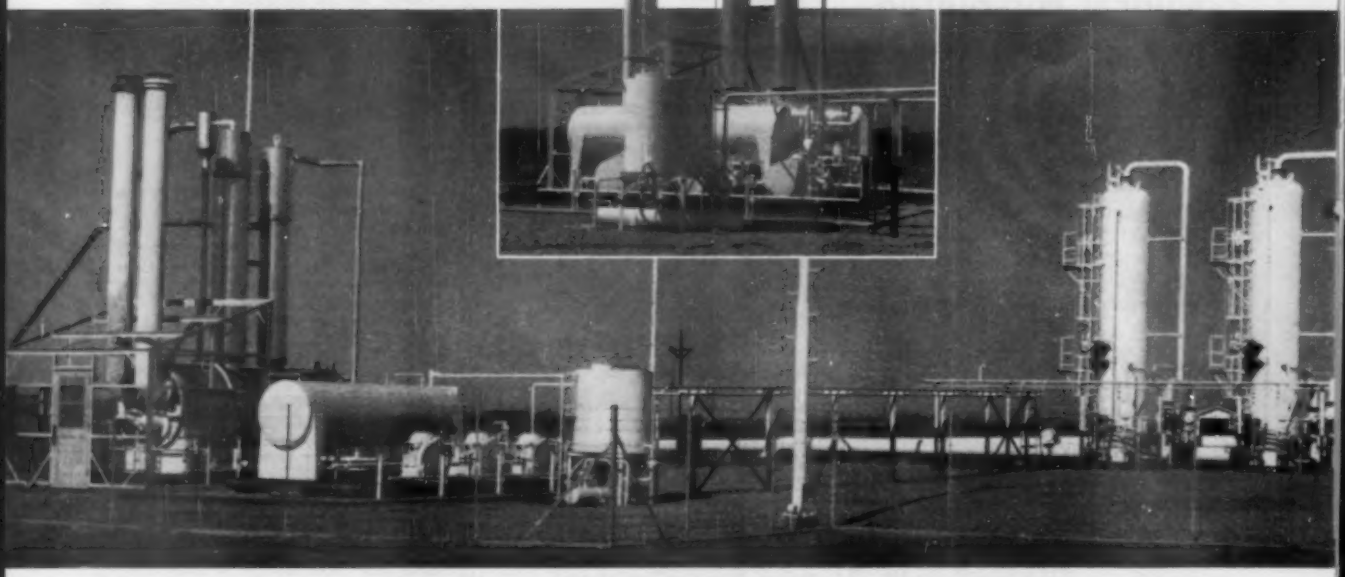

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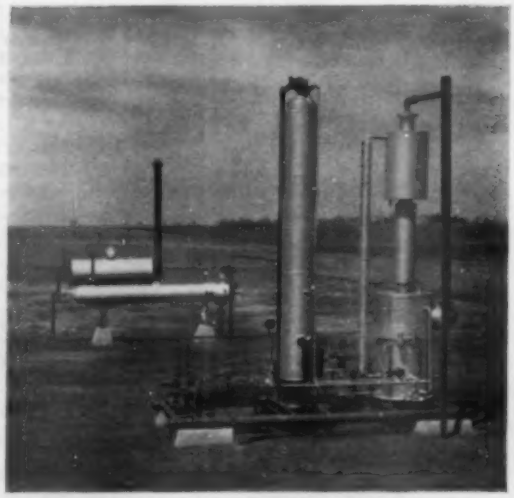

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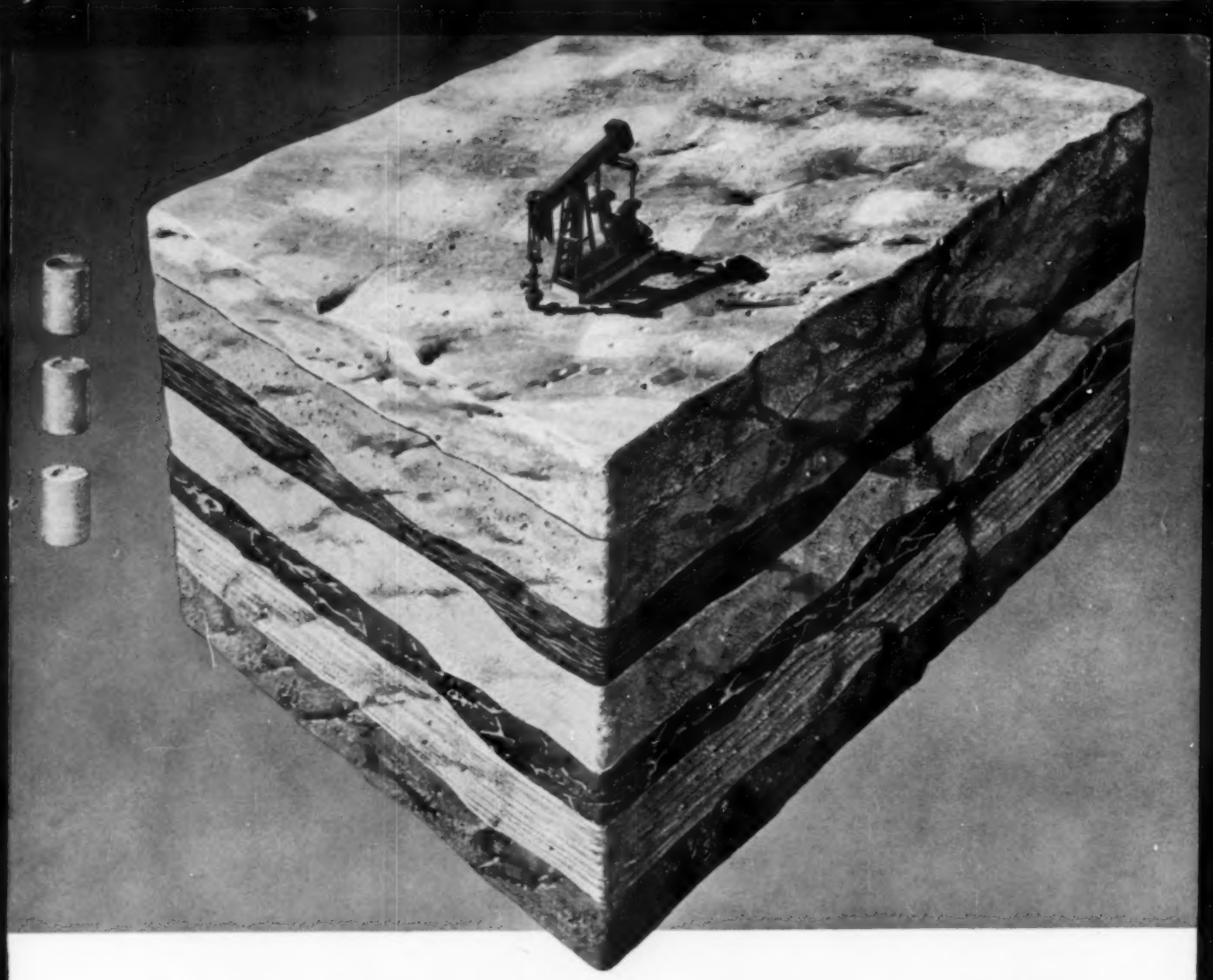

Could this be your marginal well?

If you're operating a marginal well, this illustration could be a portrait of that well. Close examination of your well logs may reveal additional zones of potential productivity and a chance for increased production—with the *right* acidizing or fracturing treatment.

Here, for example, are three adjacent oil-saturated intervals within a single section. They have dissimilar porosities, permeabilities, and acid solubilities. Production from any *one* interval would not pay out; from *two* would be marginal, but from *all three* would make a good commercial well.

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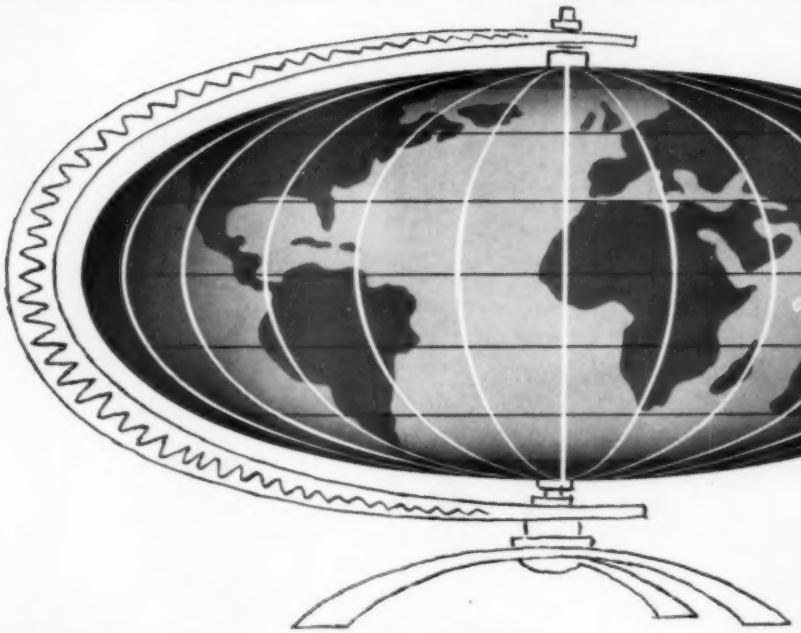

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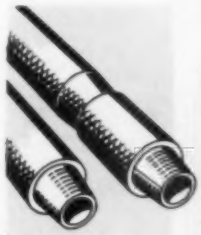

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